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·THIS BOOK·
BELONGS TO

THE NEW

# STUDENT'S REFERENCE WORK

FOR

## TEACHERS, STUDENTS AND FAMILIES

EDITED BY
CHANDLER B. BEACH, A.M.

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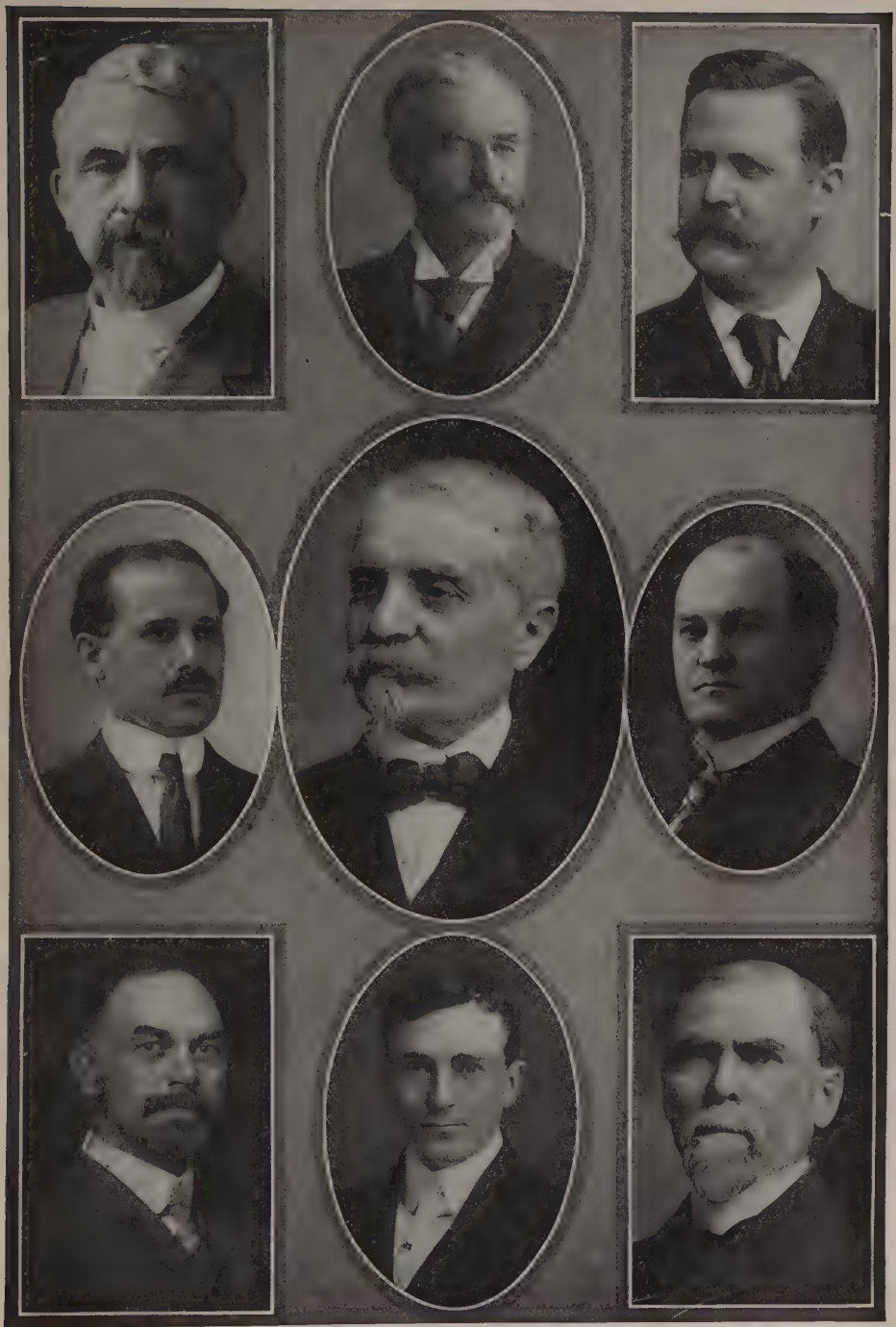

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# PREFACE

THE STUDENT'S REFERENCE WORK has long been known and valued as supplying just that reference material which is needed by teachers and pupils in elementary and secondary schools. While partial revisions have been made from year to year, yet in order to keep fully abreast of the times a radical revision and the introduction of much new material have become necessary.

Accordingly we now present THE NEW STUDENT'S REFERENCE WORK, which practically is a new work. New material has added more than one third to its volume, while the articles which appeared in the former work have been largely rewritten and entirely reset. In its preparation we were able to secure the coöperation of specialists and educators whose standing will be recognized upon inspection of our list of editors and contributors. Advantage has been taken of suggestions which have come to us from many teachers during years of experience in the use of the former work, and it is believed that the present work will be found adequate and satisfactory.

C. B. B.

## KEY TO PRONUNCIATION

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ā as in āle | | ē as in ēve | | ō as in ōld | | ŭ as in ŭp | |
| â | sen′âte | ê | êvent′ | ô | ôbey′ | û | ûrn |
| â | câre | ĕ | ĕnd | ô | ôrb | ў | pit′ў |
| ă | ăm | ẽ | fẽrn | ŏ | ŏdd | o͞o | fo͞od |
| ä | ärm | *e* | re′cẹnt | ū | ūse | o͝o | fo͝ot |
| å | åsk | ī | īce | û | ûnite′ | ou | out |
| *a* | fi′n*a*l | î | îde′a | ụ | rụde | oi | oil |
| ą | ąll | ĭ | ĭll | ụ | fụll | | |

Foreign Consonants are represented by the *nearest* English equivalents.

The Principal Accent is indicated by a heavy mark ′, the secondary accent by a lighter mark ′, at the end of the syllable.

Syllabic Division is indicated by a light hyphen.

Compound Words have their members joined by a heavy hyphen.

(*Q. V.*) is Latin for *quod vide* or *quæ vide*. In articles, after names, it means *see this*, that is, the subject named.

# THE NEW

# STUDENT'S REFERENCE WORK

## A



**A,** the first letter in the English alphabet and in many others. In English the letter has several different sounds, as in ah, at, all, ask, ale, fan, private, penal. In the French and other languages of Continental Europe it has but one sound; the broad a as in ah. This is the simplest vowel sound, given with the open mouth and throat.

**Aachen** (*ä'chen*). See AIX-LA-CHAPELLE.

**Aardvark** (*ärd'värk*: earth pig), an animal of South Africa, called also ant-bear. It is a strongly built animal, about five feet long to tip of tail; has a long snout and strong claws with which it roots and tears apart the ant hills, and with its tongue licks up the ants and other insects which are its chief food. It lives in a shallow burrow and is nocturnal in its habits.

AARDVARK

**Aaron,** the first high priest of the Israelites. He was the elder brother of Moses, his spokesman at the court of Pharaoh and his assistant in leading the Jewish nation out from Egypt. During the absence of Moses on Mount Sinai he yielded to the cry of the people and made a golden calf for them to worship. Mount Hor, whereon he died, at the age of 123 years, is still called the "Mount of Aaron."

**Abacus** (*ăb'ă-cŭs*), is the classic name for what is now often called in schools the bead frame, a device for counting by means of beads or discs which have been strung upon parallel wires. Such a machine was in use among the Greeks and Romans. The Chinese and the Persians employ it to this day. In architecture, an *abacus* is the flat tablet above the capital of a column.

ABACUS

**Abalone** (*ăb'ă-lō'nē*), a shelled sea fish of the *Haliotidae* species, popularly known as ear-shells or sea-ears, found on the rocks of the California coast feeding on seaweed. The shell is a flattened spiral, with a lining of bright mother-of-pearl, used considerably in the arts; while the animal itself is used as food by Orientals on the coast, and, gathered and dried, is exported in quantities both to Japan and to China.

**Abbey, Edwin Austin,** an American artist, was born April 3, 1852, at Philadelphia. In 1883 he removed to England. He was an illustrator of a high order and a painter of watercolors that reveal ability as a colorist. His chief characteristic was love for English country life and scenery and for old poets and dramatists. His most famous painting is *The Quest for the Holy Grail,* in the Boston Library, and his illustrations of Shakspere and Goldsmith are notable. King Edward VII commissioned him to paint the coronation at Westminster. Died Aug. 1, 1911.

**Ab'bott, Hon. John J. J. C.,** born in 1821 at St. Andrews (Quebec), educated at McGill University. Called to the Bar in 1847. For ten years Dean of the Faculty of Law at McGill. At one time a Director of the Bank of Montreal. Counsel for the Canadian Pacific Railway. Elected to the House of Commons 1867. Selected by the Government in 1888 for a mission to Australia to further trade relations and cable communication. Called to the Senate in 1887. Leader for the Government in the Senate from 1887 to 1891. Became Premier of Canada in 1891. Author of the Insolvency Act which he carried through Parliament. Was Mayor of Montreal in 1887 and again in 1888. An authority in Parliament on matters of banking and commerce. He died in 1893.

**Ab'bott, Lyman,** American preacher, editor and author, was born in 1835, the son

of Jacob Abbott. After graduating from the University of the City of New York he studied law, but entered the ministry and became pastor of a Congregational church in Terre Haute, Ind. Later he became editor of *The Christian Union*, New York, now *The Outlook*, and succeeded Henry Ward Beecher as pastor of Plymouth Church, Brooklyn. Here he became widely known both as preacher and editor, and as the author of several commentaries and other books. Among his works are *The Evolution of Christianity; Christianity and Social Problems; An Evolutionist's Theory; The Rights of Man; The Life and Literature of the Hebrews.*

**Ab'botsford,** celebrated as the home of Sir Walter Scott, is situated on the Tweed river, near Melrose Abbey, Scotland. It was named from a ford where the abbots of Melrose Abbey crossed the Tweed. The house is an irregular, picturesque mansion, built by Sir Walter Scott in 1811, in the style of the old English manor houses. Carved stones taken from old castles and abbeys are placed at intervals in the walls of the house and garden. The lavish use of money in adorning Abbotsford was one of the chief causes of Scott's financial failure.

**Abattoir** (*ăb'ăt'twär'*), originally merely a slaughter-house, but now inclusive of a number of industries connected with the disposal of the parts of animals unfit for food. The term is sometimes made to include also the market at which the products are sold.

What to do with the waste parts of slain animals has always been a problem where population was dense enough to necessitate much butchering. In the time of the Roman Empire the killing was restricted to one section of the city, and here there was a public market, and sometimes, as in Rome, a splendid market building. Previous to 1810 in Paris killing of animals was allowed even along the principal streets, and conditions had become so bad that a commission was appointed in that year to do away with the nuisance. Under the direction of this commission five great abattoirs were opened in September, 1818, and these have to a great extent been models for the world. London did not take up the matter in a serious way until 1852, and then in 1855 opened a great establishment at a suburb called Islington. But it has remained for America, in very recent times, to perfect the greatest of these institutions. Machinery has been so much brought into use that an almost marvelous speed and economy is attained. Perhaps an even more wonderful advance has been made in the matter of using the various parts of the animals which were once a nuisance. Such products as special foods, medicines, building materials, chemicals, manures, etc., utilize practically every particle of an animal and so solve the problem of their disposal.

**Abbre'via'tions** are used to save time in writing. In letter writing they should on the whole be avoided. Before printing was invented, however, the labor of copying and the cost and scarcity of parchment caused abbreviations to be used so freely that they are apt to be very difficult to follow. Signs, like $ or £ are not, properly speaking, abbreviations, but symbols. An abbreviation generally consists of the first part of a word, or else of the first letters of the words of a well-known phrase. Those which follow still occur frequently:

A. B.....Bachelor of Arts.
A. C.....Ante Christum, before Christ.
A. D. .....Anno Domini, in the year of our Lord.
A. D. C.....Aide-de-camp.
A. H. .....Anno Hegiræ, in the year of the Hegira. or since 622 A. D.
Ad lib.....Ad libitum, at pleasure.
æt. .....ætatis, aged.
A. M. .....Ante Meridiem, before noon.
A. M. .....Master of Arts.
Anon. .....Anonymous.
A. U. C.....Ab urbe condita, from the founding of the city of Rome.
A. V.....Authorized Version.
b. .....Born.
B. A.....Bachelor of Arts. Same as A. B.
Bart.....Baronet.
B C.....Before Christ.
B C. L. ....Bachelor of Civil Law.
B. D.....Bachelor of Divinity.
Bp. .....Bishop.
B. S. or B.Sc.Bachelor of Science.
C. .....Centum, one hundred.
C. ..... Centigrade.
Cantab. ....Cantabrigiensis, of Cambridge.
C. B.....Companion of the Order of the Bath.
c. c. .....Cubic centimeter.
C. E. .....Civil Engineer.
C. M. Cy....Companion of the Order of St. Michael and St. George.
Co. .....Company.
Co. .....County.
C/O. .....Care of.
C. O. D.....Cash on Delivery.
Cr.....Creditor.
Cresc.....Crescendo, growing louder.
Cwt. .....Hundredweight.
d. .....Died.
d. .....penny.
D. C.....District of Columbia.
D. C. .....Da capo, from the beginning.
D. C. L.....Doctor of Civil Law.
D. D. .....Doctor of Divinity.
D. D. S. ....Doctor of Dental Surgery.
D. G.....Dei gratia, by the grace of God.
Dim.....Diminuendo, less loudly.
D. Lit. .....Doctor of Literature.
Do.....Ditto, the same.
Dr. .....Debtor.
Dr. .....Doctor.
D. Sc. .....Doctor of Science.
D. S. O. ....Companion of the Distinguished Service Order.
D. V.....Deo volente, God willing.
dwt.....Pennyweight.
e. g.....Exempli gratia, for example.
etc. .....Et cetera, and so on.
et seq.....Et sequentia, and the following.
F. .....Fahrenheit.
f. .....Forte, loudly.
f. o. b.....Free on board.
ff.....Fortissimo, very loud.
F. R. C. P...Fellow of the Royal College of Physicians.
F. R. C. S...Fellow of the Royal College of Surgeons.
F. R. G. S...Fellow of the Royal Geographical Society.
F. R. S. ....Fellow of the Royal Society.
G. C. B.....Grand Cross of the Order of St. Michael and St. George

H. M. S. ....His Majesty's Ship, or Service.
ibid.....ibidem, in the same place.
i. e.....Id est, that is.
I. H. S.....Jesus hominum Salvator, Jesus the Saviour of men.
Incog.....Incognito, unknown.
Inst.....Instante mense, in the current month.
J. P.....Justice of the Peace.
Jr.....Junior.
K. C.....King's counsel.
K. C. B.....Knight Commander of the Bath.
K. C. M. G..Knight Commander of St. Michael and St. George.
£.....Libra, pound (British money).
lb.....Pound weight.
Litt. D.....Doctor of Letters.
LL. B .....Bachelor of Laws.
LL. D .....Doctor of Laws.
M.....Monsieur.
MM.....Messieurs.
M. B. .....Bachelor of Medicine.
M. C.....Member of Congress.
M. D.....Doctor of Medicine.
M. E.....Mining, or Mechanical, Engineer.
Mlle.....Mademoiselle.
Mme.....Madame.
M. P.....Member of Parliament.
MS .....Manuscript; plural, MSS.
N. B.....Nota bene, mark well.
Nem. con....Nemine contradicente, no one opposing.
Ob. .....Obiit, died.
Oxon. .....Oxoniensis, of Oxford.
p.....Piano, softly.
Ph. B.....Bachelor of Philosophy.
Ph. D.....Doctor of Philosophy.
P. M.....Post Meridiem, afternoon.
pp.....Pianissimo, very softly.
P. P. C.....Pour prendre congé, to take leave.
p.....Page; plural pp.
pro tem.....Pro tempore, for the time.
prox.....Proximo mense, in the next month.
P. S.....Post scriptum, postscript.
Q. E. D.....Quod erat demonstrandum, which was to be proved.
Q. E. F. ....Quod erat factendum, which was to be done.
q. v.....Quod vide, which see.
R. A.....Royal Academician.
R. I. P..... Requiescat in Pace, may he rest in peace.
R. M.....Royal Marines.
R. N.....Royal Navy.
R. S. V. P...Répondez s'il vous plait, please reply.
R. V.....Revised Version.
S .....South, shilling, or saint.
S. P. Q. R...Senatus populusque Romanus, the Senate and Roman People.
sq.....Sequens, the following; plural sqq.
Sr.....Senior.
S. S. .....Steamship.
ult.....Ultimo mense, last month.
U. S.....United States; U. S. A.
U. S. N.....United States Navy.
V. C.....Victoria Cross.
v. or vs.....Versus, against.

**Abd-el-Kader** (*ăbd'el-kā'dĭr*) (born 1806, died 1883), was emir or prince of the Arab tribes in Algeria. He is famous for his stubborn resistance to the French, who, in 1830, had driven out the Turks, the former rulers of the country. For eighteen years he fought with bravery and high generalship against the larger forces of the French. Five successive generals were sent against him, some of the tribes were bribed to desert, and the Moors were made to attack him. Yet he utterly defeated the French twice, and kept up a successful resistance till 1848, when he was defeated, and soon after captured and imprisoned for four years at Paris. In 1860 Abd-el-Kader was in Damascus, and, at great risk to himself, aided the Christians during the Mohammedan riots. In the later years of his life he was a pensioner of the French government.

**Abdul-Hamid II** (*ăb'dŏŏl-hā'mīd*), Sultan of Turkey and tributary states, from 1876 to 1909, was the second son of Sultan Abdul-Medjid, of the House of Othman. He was born Sept. 22, 1842, and succeeded to the throne on the deposition of his elder brother, Murad V, on Aug. 31, 1876. He was a Turk and Mussulman of the old school and consequently showed little inclination towards reform within the Ottoman Empire, which was stipulated by the Treaty of Berlin, in 1878, following on the war with Russia of the previous year, which proved disastrous to the Porte. In later years he lived under the dread of assassination and showed distrust even of his own ministers. He looked askant at England's operations in Egypt, and was believed to have secretly stimulated the rebellion of Arabi Pasha in 1882.

The same malign influence was also known to be at work in Armenia, where the Christian world was horrified at the atrocities committed there by the Turkish soldiery. Resistance to the outrage and rapine there has been greatly handicapped by jealousies among the European Powers.

In 1908, following a revolt led by the Young Turks' party and involving the army, Abdul was forced to grant a Constitution, and an assembly, but in April 1909, a revolt against the new order was instigated by the Sultan. This was quickly put down. Abdul Hamid was dethroned and his brother Reshed Effendi was placed on the throne as Mehmed V. The change was attended with massacres at Adana and other places.

**A Becket.** See BECKET.

**A'bel,** the second son of Adam, was a shepherd and offered a sacrifice of the "first-lings of his flock." His offering was preferred to that of his brother Cain, who in anger killed him. This violent death gave him the title of the "first martyr."

**Ab'elard** (*ăb'e-lard*), **Pierre,** a brilliant French scholar, was born in Brittany in 1079. Moved by a thirst for knowledge he gave his family inheritance up to his brothers and went to Paris, where he devoted himself to study. His fearless independence intellectually, and his success in public debates, led him to establish a school of his own, which became so famous that other teachers were almost deserted. He fell in love with Héloïse, a beautiful and accomplished girl, one of his pupils. As marriage would interfere with his rising in the church, Abelard and Héloïse were secretly united. Their union soon became known, and they separated, Abelard becoming a monk and Héloïse a nun. Devoting himself to theology he was tried and convicted of heresy, and driven to found a hermitage, which he called the Paraclete. He gave up this

retreat to Heloïse, and when he died, in 1142, she had him buried there. At her death she was interred by his side. In 1800 their remains were removed to Paris, where they now rest in the cemetery of Pére-la-Chaise, A figure of Abelard reclines on the tomb, and by its side stands a statue of Héloïse.

**Abercrombie** (*ab'er-krŭm-bĭ*), **James** (born 1706, died 1781), a British general who took part in the French and Indian war. In 1758 he was appointed commander-in-chief of the forces in America. He attacked Ticonderoga at the head of 15,000 men, but was defeated by Montcalm (July 8, 1758). He returned to England, where he became a member of parliament and governor of Stirling Castle.

**Aberdeen** (*ăb-er-dēn'*), the principal city of northern Scotland, receives its name from two Gaelic words meaning "at the mouth of the Dee," where it is situated, about 100 miles northeast of Edinburgh. Its charter dates from 1179. It was burned by the English in 1336, and after its restoration called New Aberdeen. It has large factories of cotton, woolen and linen fabrics, exports granite extensively, and is engaged in whale fisheries and in shipbuilding. It is the seat of the University of Aberdeen. Population (1911) 163,084.

**Aberdeen, Earl of** (Rt. Hon. J. C. Hamilton-Gordon, P.C., G.C.M.G.), a Scottish Liberal peer, was born Aug. 3, 1847, and educated at St. Andrews and at Oxford. He succeeded to the title in 1870. In 1886 he was appointed by Mr. Gladstone Lord-lieutenant of Ireland, with the mission of carrying out the Home Rule policy of the then Liberal government. This office he held but a few months, though he was very acceptable to the Irish people; but with the fall of the Gladstone administration he resigned the post, and subsequently made a tour of the world, visiting the chief British colonies. From 1893 to 1898 he acted as Governor-General of Canada, and later he was Viceroy of Ireland.

**Abitibi** (*ă'bē-tib'ē*). Two important lakes and a river of the same name in northeastern Ontario (Canada). The upper Abitibi Lake (connected with the lower by a "Narrows" about two miles in length) covers an area of about 190 square miles, one-third of this area being in the Province of Quebec. One-half of the shore line is rocky. Innumerable islands of all shapes and sizes dot the lake, giving it a natural beauty equal to that of the St. Lawrence River. The lower lake has an area of 145 square miles. The Abitibi River discharges the waters of these two lakes, emptying with other streams into the Moose River, which a short distance further on empties into James' Bay.

**Abolition of Slavery.** See SLAVERY.

**Aborigines.** See INDIANS.

**Aboukir.** See NILE, BATTLE OF.

**Abraham,** the head of the Hebrew nation, was born at Ur, in Chaldæa, about 2000 B. C. He left his people, who were idolaters, to worship the one God, and dwelt in Palestine, leading the life of an Arab chief. His original name, Abram, was changed to Abraham, meaning "father of a great nation." He died near Hebron, aged 175 years, and is noted for his faith in God, being called the "Father of the Faithful."

**Abraham, Plains of.** A level tract of land about one mile in width immediately west of the city of Quebec, named after Abraham Martin, who at one time owned it. The scene of the memorable battle, which wrested from the French their supremacy in North America.

The British troops had been besieging the city for some time without success. Autumn was approaching and the admiral in command of the fleet refused to remain longer. Wolfe, the young general in command of the army, resolved on one last desperate venture. Embarking all his available troops on the vessels of the fleet he moved up the St. Lawrence some miles beyond the city. The French were bewildered by the ever-changing tactics of their opponents, and when, on the night of the 12th of September (1759), the British army dropped down the river in boats and scaled its precipitous bank, there was only a small guard at the top to offer ineffectual opposition. Daybreak found Wolfe's army drawn up in battle array on the plains. The gallant French general, Montcalm, immediately marched from the city with all his available troops and impetuously attacked the British forces. The thin red line of British troops held their fire until the French were within 40 paces and then shattered their ranks with two accurately delivered volleys. The French ranks broke and fled, and Wolfe lived long enough to know that his desperate attempt had been entirely successful. Montcalm died a few hours later. The British loss was some fifty killed and five hundred and ninety-seven wounded, while that of the French was about one thousand five hundred, including two hundred and fifty prisoners.

On the 17th of the same month the city surrendered and (save Montreal) Canada was in the hands of the British. The following spring the French force marched from Montreal over well-nigh impassable roads, and a second and bloodier battle was fought on the plains, resulting in the British force being repulsed and driven within the walls. The timely arrival of some British frigates, however, caused the siege to be raised, and Quebec and all Canada then became part of the British possessions.

The celebration of the coming of the great voyager Champlain to Quebec was

held in 1908, and in this connection there was consummated a movement to make the Plains of Abraham a National Park, and erect in its center a monument to Peace.

The federal government of Canada and the governments of the various provinces as well joined in aid of this celebration which proved to be one of the most imposing ever held in Canada. The presence of the Prince of Wales, who came to Canada specially to take part in it, added to the enthusiasm of the occasion.

**Abruzzi** (*à-brōōt'sē*), **Duke of,** known also as Prince Amadeo of Savoy, a member of the royal house of Italy and a distinguished explorer, aeronaut, sportsman and scientist, son of ex-King Amadeus of Spain, was born in 1873 in Madrid and educated in part at the Naval College in Leghorn. As a youth he travelled round the world, and in 1896 successfully ascended Mount St. Elias, in Alaska, whose ice-covered peak is over 18,000 feet in height. In 1899 the Duke set out from Christiania on an Arctic voyage in the *Stella Polare*, and wintered in Teplitz Bay, 81° 47′ N. There he organized a sledge party, to proceed toward the North Pole, but an accident to his ship prevented the Duke from accompanying it. It was, however, manned under the command of his chief officer, Captain Cagni, the expedition reaching the most northerly point attained up to that date, viz.: 86° 34′ N., or within 236 statute miles of the Pole. The narrative of the expedition is told in the Duke of Abruzzi's book, *On the Polar Star in the Arctic Sea*, published in 1903. The Duke's achievement beat that of Nansen in *The Fram*, in years 1893–94, the Norwegian explorer having in his sledge journey only reached 86° 4′ N., 96° E.

**Ab'salom,** the third son of King David, was noted for his personal beauty and winning manners. By these qualities he seduced the people into rebellion against his father. He was defeated in battle, caught by his beautiful hair in the branches of an oak as he fled, and slain by Joab against the orders of his father, who mourned his death in a most touching lament.

**Absinthe** (*ăb-sinth'*), a popular French liquor, agreeable to the taste, but one of the most dangerous stimulants ever manufactured. It is made from oil of wormwood and alcohol, with the addition of several volatile oils.

**Absorp'tion** (in plants), the method by which almost all plants take materials from the outside into their bodies. Plants absorb water and a great variety of substances soluble in water. Because the protoplasm of plant cells forms about each a continuous covering, the cell wall having no visible openings, and because both cell wall and protoplasm hold among their particles large amounts (50–98 per cent) of water, all substances, whether solid or gaseous, must be dissolved in water before they can enter the plant. When so dissolved the particles are free to move through the water, and tend to distribute themselves uniformly. As the water outside is continuous with that forming part of the body, the particles may migrate into the plant almost as readily as in other directions. They will enter it if of suitable size, and if the water inside contains less of that substance than the water outside. The movement of each sort of material is independent, and a substance will continue to enter until it becomes equally distributed. If it is being used or stored, it may be absorbed in large amounts. Similarly water moves from the places where there are fewest particles of all the dissolved substances, *i.e.*, where there is most water, toward the places where there is relatively less water. As water is constantly evaporating from land plants large quantities of water must be absorbed to balance this loss. The absorption of all substances is subject to regulation by the living protoplasm. Not all substances soluble in water are permitted to enter, nor at all times.

**Abstinence.** See TOTAL ABSTINENCE.

**Abt** (*ăpt*), **Franz,** born at Eilenburg, in Saxony, Dec. 22, 1819. As his father, who was a clergyman, designed to educate him for his own profession he was placed in the St. Thomas school and in the University of Leipsic, where he had the advantage of good training in music as well as in the usual academic branches. He finally relinquished his theological studies for the more congenial musical studies. In 1841 he obtained the position of capellmeister at Zurich, and eleven years later obtained the same position at Brunswick. His death occurred at Wiesbaden, March 31, 1885.

Abt is best known as a composer of part-songs for men's voices. His early residence at Zurich, where he conducted male singing societies, developed a facility in this class of composition that resulted in his great popularity. His songs for a single voice have had wide acceptance, notably the one entitled "When the Swallows Homeward Fly." Besides songs he has written pieces for the pianoforte, which are regarded as inferior to his vocal compositions. In all, his works embrace more than four hundred numbers, none of which, however, entitles him to rank with the great German composers.

**Aby'dos** (*a-bī'dos*), an ancient city in Asia Minor, celebrated as the place where Xerxes crossed the Hellespont in his invasion of Greece, in 480 B. C. When his bridge of boats, nearly a mile in length, was swept away by a storm he punished the sea by inflicting three hundred lashes and casting chains into its waves. When the

second double bridge was built, Xerxes poured an offering of wine on the waters and prayed to the sun; then throwing a cup and a Persian sword into the Hellespont he ascended his throne on the heights of Abydos. Here he watched for a whole week the ceaseless march of his army, perhaps a million in number, made up of forty-six different nations, each dressed in its national costume. Abydos is famous also as the scene of the story of Hero and Leander, which see.

**Abyssinia** (*ăb'i-sin'ĭ-ā*), a country of eastern Africa, southwest of the Red Sea. It is a tableland, from which rise flat-topped mountains, intersected by deep valleys and gorges. The royal house, which reigned for centuries, traced its lineage back to the Queen of Sheba. In 1850 Theodorus, a military adventurer, revolted and was crowned emperor. He first sent embassies to England and France and received a British consul at his court. It was his imprisonment of the consul and of an embassy sent to inquire into the matter that caused the English government to send Sir Robert Napier from Bombay with a relief expedition. The capital, Magdala, was stormed and captured, Theodorus shooting himself when told that the city gates had given way. This occurred in 1868, and for some time after the English forces withdrew lawlessness prevailed. In 1872 John II was crowned emperor. He was killed in battle in 1889 and was succeeded by his adversary, Menelek, the present king, who reigns under the title of Menelek II. In 1885 Italy occupied the port of Massowah, and sought to acquire territory inland, claiming, by treaty in 1889, a protectorate over Abyssinia. This led to a protracted war, and in 1896 the Italian army of invasion was beaten with great loss. As a result, Italy withdrew her claim to a protectorate over Abyssinia. In 1902 the boundary between Abyssinia and the British Sudan was adjusted by treaty. The area of Abyssinia is over 400,000 square miles, with an estimated population of five and a half millions. There are many small towns, few with a population exceeding 5,000. But little land is cultivated, the chief pursuit of the people being the herding of cattle, sheep and goats. A railway line connects Diré Dawa in southeastern Abyssinia with the port of Jibuti, 186 miles distant. Telegraph and telephone systems are in use. Barley, wheat, millet, hops and tobacco are produced in considerable quantities. The annual product of coffee is about 50,000 bags.

**Academy, The French,** founded in 1635 by Cardinal Richelieu, was the great authority in France in all matters of scholarship until it was disbanded during the French Revolution in 1793. Its members were forty of the first scholars of the country, who met three times a week. Its greatest work was the publication of its dictionary of the French language after fifty years of labor. The Academy was reconstructed in 1795, and in its original form it was restored by Louis XVIII in 1816.

**Aca'dia** (*a-kā'dĭ-a*) or Acadie. It was in 1497, or thereabouts, that the Cabots visited, if they were not the discoverers of, Nova Scotia. French Colonists came here in 1604. They were driven out by settlers from Virginia who rested their claim on the right of discovery. The French gave the land the name of Acadie. In 1621 it was changed to Nova Scotia. In 1621 James I granted the peninsula to Sir William Alexander. In 1654 the French again established themselves in the colony. The country was ceded to them in 1667, but the English regained it in 1713.

The French Acadians now make one-tenth of the population of Nova Scotia. In only one county (Richmond) have they a majority. They are as one to four of the population of New Brunswick. Their settlements in New Brunswick are compact. One-seventh of the population of Prince Edward Island is Acadian. Their chief center in Prince Edward is at Tignish, on the west coast. There are 140,000 Acadians in the maritime provinces.

**Accordion** (*ăk-kor'dĭ-ŭn*), a musical instrument invented by Damian, at Vienna, about 1829. It is made on the principle of a bellows, the sound being produced by the action of wind on metallic reeds. Keys are ranged on each side, which are touched by the fingers as the instrument moves backward and forward. It is manufactured chiefly in Paris.

**Acetylene** (*a-sĕt'ĭ-lēn*) ($C_2$ $H_2$), a gas, slightly lighter than air, which is extensively used for illumination. It burns with a brilliant, white flame, which is smoky, except when specially constructed burners are used. It is usually prepared by the action of water upon a calcium carbide, a material made by exposing a mixture of limestone and coke to a very high heat in the electric furnace. With air, acetylene gives explosive mixtures, and when under pressures of two or three atmospheres, or more, it is powerfully explosive by itself. The pure gas is said to be odorless and non-poisonous, but, as usually made, it contains small quantities of strong-smelling and somewhat poisonous gases. Acetylene gas is widely used in villages and country houses not served by ordinary gas systems, consumers installing necessary apparatus and generating their own gas.

**Achaean League** (*ă-kē' ăn lēg*), originally a confederacy of ten cities of Achaia, which grew into power after the fall of the greater Greek powers. Later it included nearly all the Greek cities, and for fifty years resisted the attacks of Rome.

**Achaia** (*ā-kā'yā*), one of the ancient divisions of the Peloponnesus, extending along the Gulf of Corinth. Its inhabitants were the most powerful of the Greeks at the time of the Trojan war. Under the Romans Achaia included the whole Peloponnesus as well as the country across the gulf as far as Thessaly. In modern Greece it is a small province.

**Acheron** (*ăk'er-ŏn*), in ancient mythology, a river of the lower world around which hovered the shades of the departed, and across whose waters the ferryman, Charon (*ka'ron*), piloted those who were permitted to enter the realm of the dead. Acheron was also a general name for Hades.

**Achilles** (*a-kĭl'lēz*) was the bravest of the Greeks in the Trojan war, and the hero of the *Iliad*. His father, Peleus, was a descendant of Zeus, the king of the gods, and the ruler of the Myrmidons, the warlike people of Phthia, in Thessaly. His mother, Thetis, a sea goddess, is said to have dipped him by the heel into the river Styx to make him invulnerable, as she had been forewarned that he was doomed to an early death. For the same reason, after he had been trained in the arts of war and eloquence by Phœnix, and in the healing art by the centaur, Chiron (*kī'ron*), his mother had him brought up secretly as one of the daughters of the King of Scyros (*sī'ros*). At the outbreak of the Trojan war an oracle declared that Troy could not be taken unless Achilles were present. So Ulysses, the wisest of the Greeks, came to Scyros disguised as a peddler, and spread out his wares before the daughters of the king. Ulysses sounded an alarm, and while the girls ran away the disguised Achilles betrayed himself by seizing a sword and spear from the peddler's stock. Achilles went to war with fifty-seven ships, and during the first nine years he sacked twenty-three cities around Troy. He quarreled with Agamemnon over a maid, Briseis, whom he loved. When she was taken from him he sulked in his tent, while his countrymen were hard pressed because their bravest warrior, whom the Trojans dreaded, was not there. At last his friend Patroclus, wearing the armor of Achilles, drove the enemy before him, but was slain by Hector, the leader of the Trojans. Achilles, enraged at the death of his friend, went against the Trojans and drove them within their walls. In single combat he killed Hector, whom he dragged three times around the city at his chariot wheels. Here the *Iliad* ends, but the story is taken up by the *Æthiopis*, a poem by Arctinus, which tells of the combat of Achilles, first with the Amazon Penthesilea, and next with Memnon. When Memnon fell, Achilles drove back the Trojans to the Scæan gate, where he was killed by an arrow from the bow of Paris, which pierced his vulnerable heel.

**Ac'id**, a term used in chemistry to denote a class of substances whose union with an alkali, or other base, forms salts. Strictly speaking, all acids contain hydrogen, and are, in fact, salts of hydrogen. Most of them have the following properties: they can be dissolved in water; they have a sour taste; they turn vegetable blues to red. The most common and useful inorganic or "mineral" acids are sulphuric, nitric and hydrochloric acids, which are manufactured on a very large scale. Among the organic acids are acetic acid, which gives vinegar its sour taste: citric acid, which produces the sourness in lemons; oxalic acid, which is found in sorrel and some other plants, and which in large quantities acts as a poison; malic acid, found in apples and also currants and gooseberries; tartaric acid, found in grapes and used in the manufacture of baking powder; prussic or hydrocyanic acid, a deadly poison, a small quantity of which is found in bitter almonds and in the leaves and stones of peaches. Many hundred acids are known to chemists, the greater part of which are artificial.

**Aconcagua** (*ā-kŏn-kā'gwā*), a central province of the Republic of Chile, bounded on the north by the province of Coquimbo, on the south by Santiago and on the southwest by Valparaiso, flanked on the east by the Andes and the Argentine Republic, and on the west by the South Pacific Ocean. Its area is 5,485 square miles, with a population (1910) of 131,331. Its capital is Felipe. On the range of the Andes, within the Argentine boundary, is the extinct volcano of Aconcagua, deemed the loftiest elevation in the New World, with an estimated height of 23,000 feet. The Aconcagua River flows seaward through the province and gives the latter its chief fertility in grain, hemp and a variety of fruits. Copper deposits are found in the province.

**A'corn**, fruit of the oak, a nut once considered an important article of food. The ancients thought eating "oaken mast" gave length of years and strength to man. The Indians of New England and farther south ate the acorns of white oaks of several species. The sweet acorn of the California white oak, Indians of the Pacific Coast bake, shell and grind into a coarse meal from which they make bread. Chinese and Japanese use certain acorns for food. Today in some English villages the people hold to the old "right of pannage," and in autumn turn their hogs into the royal forests to fatten on the fallen acorns.

**Acoustics** (*a-kōōs'tĭks*). Those phenomena which one detects by the ear are generally studied together under the head of acoustics. But whenever any sound is heard we find that somewhere in the neighborhood there is what we call a sound-

ing body, and this is always found to be a body in rapid vibration. Besides this we find that if the sounding body be supported on a bit of cotton wool, placed under the receiver of an air pump, and the air exhausted, the sound is almost entirely extinguished. We are thus led to believe that two things are always essential to the production of sound, *viz.*, a rapidly vibrating body and an elastic medium, generally air, between that body and the ear.

Accordingly the subject of acoustics is made to include a study of vibrating bodies, such as a piano wire, a violin string, an organ pipe, etc., and also of the bodies which transmit vibrations to the ear, such as air, wooden rods and other elastic media.

The structure of the ear and the sensation of sound are generally studied under physiology, and are seldom included under acoustics.

### A VIBRATING STRING

One of the most typical of vibrating bodies is a stretched string, such as is employed in the guitar or the harp. When a string of this kind is plucked by the finger a series of waves is started in the string, and these waves are reflected from the fixed ends of the string in such a way that the string vibrates as a whole, to and fro, in a manner familiar to every one. It has been found by experiment that the number of vibrations which a string will make in one second, *i.e.*, the *pitch* of the string, depends upon three things only, namely, the length of the string, the force with which it is stretched, and the mass of unit length of the string. This may be described more definitely as follows:

If we denote by $n$ the pitch of the string, whose length is $l$, by T the stretching force, and by $m$ the mass of unit length, then

$$n = \frac{1}{2l}\sqrt{\frac{T}{m}}$$

Evidently, therefore, we can raise the pitch of a string in two ways, either by increasing the stretching force, *i.e.*, by increasing T, or by shortening its length, *i.e.*, by diminishing $l$.

### SOUND A WAVE MOTION

The evidence for thinking that the disturbance which we call sound is a wave motion in the air is as follows:

1. Sound is reflected from buildings or hillsides just as water waves are reflected from a wharf. This is the familiar phenomenon of the echo.

2. Two sounds can be added together to produce silence. The simplest method of doing this is to hold a tuning fork near to one ear, front of you, and while it is still vibrating rotate it slowly about its stem as an axis. It is found that there are certain positions in which the disturbance from one prong of the fork will just annul the disturbance from the other prong of the fork, thus adding two sounds together to produce silence.

3. Sound waves can actually be seen by properly illuminating the air with an electric spark. This was first done by Toepler of Dresden. More recently Professor R. W. Wood has succeeded by this method in making instantaneous photographs of sound waves, showing just what portions of the air are condensed and what portions are rarefied at the instant.

### SPEED OF SOUND IN AIR

It has been found by experiment that sound waves of all lengths travel in air with the same speed. This is evident, indeed, from the fact that the "time" of an orchestra is just as perfect at long distances as at short distances.

Among the best measures of this speed are the following:

| Observer. | Speed of Sound in Meters per sec. Temp. = 0°C. | Method. |
|---|---|---|
| Moll and Van Beck | 332.77 | Eye and ear |
| Regnault | 330.71 | Mechanical |
| Szathmari | 331.57 | Unison |

As a mean we may take 332 meters per second, which is equivalent to 1,089 feet per second, at a temperature of 0° C. Newton and Laplace first showed how the speed of sound may be computed in any gas as soon as its pressure and its density are known. For they proved that if V denotes the speed of sound in a gas in which the density is D and the pressure P, then

$$v = \sqrt{\frac{k\,P}{D}}$$

where $k$ is a constant, which for most gases has the approximate value of 1.4. But it has been found that the value of this constant, $k$, depends upon the number of atoms in one molecule of the gas. If there is but one atom in the molecule then $k = 1.6$. Accordingly when chemists wish to determine how many atoms there are in a molecule of any given gas they measure the speed of sound in that gas, then measure the pressure and density, and afterward compute $k$ by the use of the expression given above.

### MUSICAL TONES

The sound which is produced by a regular and rapid vibration is called a "musical tone," while the sound which is produced by irregular vibrations is called a "noise." Every musical tone possesses three features by which it may be distinguished from all other musical tones. These are *loudness*, *pitch* and *quality*.

1. It has been shown that *the loudness or intensity of a sound depends simply upon the amplitude of the vibrating air particles at the ear.* The loudness of a sound will

therefore, vary not only with the distance of the sounding body, but also with the amount of vibration in the sounding body.

2. *The pitch of a note depends simply upon the number of vibrations per second, that is, the frequency of the body which produces it.*

3. But even when notes have the same loudness and the same pitch they may be quite different, as, for instance, the difference between middle C on the guitar and on the piano. Two notes of this kind are said to differ in *quality*. And *quality has been shown to depend upon the presence of other notes, called overtones, along with the note under consideration.*

THE MUSICAL SCALE

When we consider one tone in relation to other tones we are led to a study of the musical scale. Two definitions are necessary to any understanding of the musical scale, *viz.:*

1. A *musical interval* between any two notes is defined as the ratio of their frequencies. Two notes which have the same frequency are said to be in *unison*. But if the ratio be 2:1 then the interval is said to be an *octave*.

2. *The Major Triad.*—It is a very remarkable fact that the ears of all western nations consider any three notes whose frequencies are in the ratio 4:5:6 as harmonious. Such a combination is called the *major triad*, and is always pleasing to the ear.

The interval between any note and its octave is divided by musicians into a series of seven smaller intervals, called *tones* and *semitones*. These tones are called by letters of the alphabet, and together form what is known as the musical scale.

THE MAJOR SCALE.

| Name of Note. | C | D | E | F | G | A | B | 2C |
|---|---|---|---|---|---|---|---|---|
| Name of Note in Vocal Music | do | re | mi | fa | so | la | si | do |
| Interval..... | $\frac{8}{8}$ | $\frac{10}{9}$ | $\frac{16}{15}$ | $\frac{9}{8}$ | $\frac{9}{8}$ | $\frac{10}{9}$ | $\frac{9}{8}$ | $\frac{16}{15}$ |

From inspection of this table it will be readily seen that the entire Major Scale, as it is called, is made up of the three following major triads:

C : E : G = 4 : 5 : 6
F : A : 2C = 4 : 5 : 6
G : B : 2D = 4 : 5 : 6

For an excellent experimental discussion of acoustics, see Tyndall's *Lectures on Sound* (Appleton), and Blaserna's *Theory of Sound* (Int. Sci. Series). The great masterpiece in the literature of acoustics is, however, Helmholtz's *Sensations of Tone*, trans. by Ellis (Longmans). HENRY CREW.

**Acre** (*ā-ker* or *ā-ker*), a seaport of Syria. Its harbor is the best on the neighboring coast. It is very old, and famous for the attacks and sieges it has sustained, particularly the assault of Richard Cœur de Lion in 1191, and the sixty days' siege of Napoleon in 1799. Population, 10,000.

**Acropolis.** See ATHENS.

**Ac'tinism** (Gr. *aktin*, a ray), the chemical property of light, solar or other radiant energy, as the sun's rays in photography, and by which chemical changes are produced. The sun-recording instrument which measures and records the quantity of actinism present is called the *actinograph;* while the actinometer is the instrument or apparatus for measuring the chemical effects of radiation from any source, as in measuring the intensity of the rays on a photographic plate, or piece of sensitized paper, when exposed to the sunlight.

**Ac'tinomor'phic** (*ak'tĭn-o-môr'fĭk*) **Flowers.** Those whose parts are repeated uniformly about a center, like the parts of a radiate animal. Such flowers are often called "regular." Although the name applies to all parts of the flower it is most commonly used in connection with the petals. When the petals are all about alike and equally spaced about the center, as in the buttercup and the rose, the flower is actinomorphic. The contrasting phrase is "zygomorphic flowers." The noun form of the word is "actinomorphy."

**Actium** (*ak'shĭ-ŭm*), in Acarnania, the scene of the naval battle in which Octavius, afterward called Augustus Cæsar, conquered Mark Antony and Cleopatra and became, in consequence, emperor of Rome. The number of ships on each side was about the same, but the battle was lost by the cowardice of Cleopatra, who fled with her triremes (ships propelled by oars) as soon as attacked, followed by Antony, who would not be separated from her even to win an empire. The Actian games, occurring every four years, were established here by Augustus in honor of his victory.

**Ad'am,** the first man, the father of the human race. His sons were Cain, Abel and Seth. He lived to be 930 years old, and through his son Seth was the direct ancestor of the Hebrew nation.

**Adam, Graeme Mercer.** Born in Midlothian, Scotland, 1839. Educated at Edinburgh. Came to Toronto in 1858. Engaged in publishing and as bookseller (wholesale). In 1861 published the *British American Magazine*. From 1869 to 1872, edited the *Canada Bookseller*. In 1872 with Professor Goldwin Smith and others, he established the *Canadian Monthly*. Sole editor of it from 1879 to 1883. Established the *Canadian Educational Monthly* and so ably edited it for five years that it was recognized as one of the best of the kind on the Continent. For some time editor and manager of the *Bystander*, assisting Professor Goldwin Smith. In 1883 edited the *Royal Canadian Readers*. Wrote *Illustrated Quebec, Illustrated Toronto, Canada from Sea to Sea, Scenic America* and several similar volumes. Contributor to *Picturesque Canada*, which was edited by Principal Grant. Revised *Collins' Life of Sir John A. Macdonald*. Became editor in 1896 of *Self-Culture*, a new magazine published in Chicago. A volunteer officer. Commanded a company at Ridgeway, and was on that occasion presented with an address and a sword.

**Adami** (*ä-dä'mee*), **John George,** M.A., M.D., F.R.S.S., LL.D., was born in Manchester, Eng., Jan. 12, 1862, son of the late John George Adami. He was educated at Owen College, Manchester, and at Christ's College, Cambridge, studying afterward in Breslau and Paris. He took distinguished honors at Cambridge in natural science, was Darwin prizeman in 1885, M.R.C.S., and was appointed demonstrator of pathology in Cambridge University in 1887. Elected fellow of Jesus College, Cambridge, in 1891, he soon after became head of the pathological department of the Royal Victoria Hospital. Since 1892 he has been professor of pathology in McGill University, Canada. He is the author of numerous monographs upon subjects relating to pathology in French, German, English and American medical journals, and of many papers read before medical societies.

**Ad'ams, Charles Francis,** the son of John Quincy Adams, was born in Boston, Aug. 18, 1807. He graduated at Harvard College in 1825, and studied law with Daniel Webster. He was for five years a member of the Massachusetts legislature; in 1848 he was the Free Soil candidate for Vice-president, and was elected congressman in 1858, joining the Republican party. He came into great prominence as American minister to England (1861–1868), the same office formerly held by his father and grandfather. He found the great body of Englishmen hostile or indifferent to the United States. His position was one of the greatest responsibility and delicacy. In discharging its duties he showed ability and tact of the first order, and made a reputation as one of the most brilliant diplomatists ever sent out from Washington. He died at Boston, Nov. 21, 1886.

CHARLES FRANCIS ADAMS

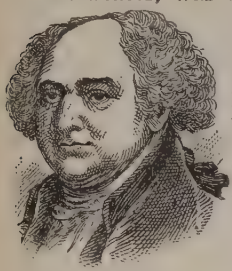
**Ad'ams, Charles Kendall,** LL.D., president of the University of Wisconsin, was born at Derby, Vermont, Jan. 24, 1835, and educated at the University of Michigan. He also studied in Germany, France and Italy. From 1867 to 1885 was professor of history in the University of Michigan, and from the latter year until 1892 was president of Cornell University. In 1892 he was elected president of the University of Wisconsin. He was the author, among other writings, of *Democracy and Monarchy in France;* of a *Manual of Historical Literature;* and of a monograph on *Christopher Columbus*. From 1892 to 1895 he acted as editor-in-chief of *Johnson's Universal Cyclopaedia*. He died July 25, 1902.

**Adams, Henry** (1838), American historical writer, third son of the late Charles Francis Adams, was born in Boston, Mass., and educated at Harvard, where he graduated in 1858. Three years later he accompanied his father as private secretary when that diplomat was appointed American Minister to England, and on his return to this country he was for several years instructor at Harvard. During the years 1875–76 he edited *The North American Review*, and in the latter year he published a work on *Anglo-Saxon Courts at Law*. Later on he took up his residence at Washington, and there devoted himself to historical research, writing *Lives* of *Albert Gallatin* and *John Randolph*, and an important *History of the United States*, in nine volumes, treating of the period 1801–17, the administrations of Jefferson and Madison. The latter work was published in 1889–91.

**Adams, Herbert Baxter** (1850–1901), American historian and educator, born at Amherst, Mass., and educated at Amherst College and at Heidelberg, Germany, obtaining at the latter the degree of Ph.D. Returning to the United States about the era when Johns Hopkins University was founded Dr. Adams became associate professor in that institute and subsequently was appointed full professor. He also became historical lecturer at Smith College, Northampton, Mass., and for a time lectured at Chautauqua. He took part in the inception of the American Historical Association and acted as its first secretary, subsequently becoming first vice-president.

He edited an important series of educational monographs issued by the U. S. Bureau of Education, and was editor also of the Johns Hopkins *Studies in History and Political Science*. His other published work embraces, besides his two volume *Life and Writings of Jared Sparks*, issued in 1893, monographs on *Maryland's Influence in Founding a National Commonwealth*, on *The College of William and Mary*, on *The Study of History in American Colleges and Universities*, on *Thomas Jefferson and the University of Virginia*, and a work on the *History of the United States Constitution*. Dr. Adams died in 1901.

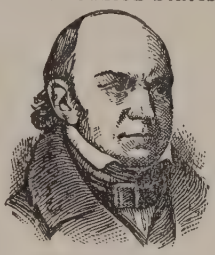
**Ad'ams, John,** second President of the United States, was born at Braintree, Mass., Oct. 19, 1735. The father of John Adams was a farmer of small means, to which he added the occupation of shoemaking. He gave a classical education to his son John, who graduated at Harvard in 1755. In 1764 he married Abigail Smith, a daughter of the minister of Weymouth.



JOHN ADAMS

He took part in the measures against the Stamp Act, and was prominent in all the steps which brought about the war of the Revolution. He was one of the five delegates from Massachusetts to the congress which met in Philadelphia in 1774, and also a member of the Continental Congress of 1775. Here, with Lee and Jefferson, he boldly advocated separation from the mother country. Of the three committees appointed, on the Declaration of Independence, on a confederation and on foreign relations, Adams was a member of the first and third. The Declaration of Independence was drawn up by Jefferson, but on Adams devolved the task of battling it through Congress in a three-days' debate. The plan of a treaty reported by the third committee was drawn up by Adams. The preparation of articles of war for the government of the army was given to Adams and Jefferson, but Jefferson left the task to Adams, who drew up the articles and argued them through Congress. Thus occupied for nearly two years he gained the reputation "of having the clearest head and firmest heart of any man in Congress." In 1777 he was appointed a commissioner to France; in 1779 he was appointed minister to treat with Great Britain for peace and commerce; and in 1782 he helped in settling the conditions of peace with England. In 1789 he was the first ambassador of the United States to Great Britain. When George III expressed his pleasure in receiving an ambassador who had no prejudices in favor of France, the enemy of the English Crown, Adams replied: "I have no prejudices but in favor of my native land." On his return to the United States he was elected Vice-president, and in 1797, was made President. In 1801 his opponent, Jefferson, was elected by a majority of one in the electoral college. Adams died July 4, 1826, on the fiftieth anniversary of the independence of the United States. See Morse's *Life*, in *American Statesmen Series*.

**Ad'ams, John Quincy,** sixth President of the United States and eldest son of John Adams, was born July 11, 1767, at Braintree, Mass. He graduated at Harvard College in 1788. Washington appointed him minister to The Hague in 1794, and later on minister to Portugal, but his father, becoming President, changed his destination to Berlin.



JOHN Q. ADAMS

In this promotion of his own son John Adams acted on the written advice of Washington, who said that young Adams was the ablest person in the American diplomatic service, and merited promotion ought not to be withheld from him because he was the son of the President. He soon became a leader of the Federal party, but separated from them on the question of the embargo. He was sent as minister to Russia and to England by Madison. He was secretary of state under Monroe. In the presidential contest of 1824 he was the cadidate of the Whig party. As no one of the candidates secured a majority of the electors chosen by the states the election went to the House of Representatives, where Adams was chosen. His administration was marked by few events of importance, though it was a period of general progress and prosperity. In 1830 he was elected to Congress, where he continued to represent his district until his death. Here he rendered perhaps the most important service in his political life, becoming conspicuous and influential in shaping tariff legislation, in arguing for the right of petition to Congress and in organizing and leading the opposition to slavery. He was stricken with paralysis while occupying his seat in the House of Representatives, and died Feb. 23, 1848. See Morse's *Life*, in *American Statesmen Series*.

**Adams, Maude,** an American actress (real name Kiskadden), was born Nov. 11, 1872, in Salt Lake City, Utah. Her mother was the leading woman in a stock company and while going to school Miss Adams often appeared on the stage in child's parts. At sixteen she joined E. H. Sothern's Company in New York in the "Midnight Bell." She

has been connected with Charles Frohman's stock company and has supported John Drew. Her most pronounced success has been in J. M. Barrie's plays, and especially in "The Little Minister." During the winter of 1906-07 she made a great success in New York in the play "Peter Pan."

**Ad'ams, Samuel,** was born at Boston, Sept. 27, 1722. He was prominent in Massachusetts in the revolutionary period, and helped very much to mould public opinion and to strengthen his fellow-citizens in their determination staunchly to uphold their rights. He got up town meetings, wrote the protest which Boston made against the Stamp Act, was a leader in debate, and so formidable an opponent that attempts were made by the English party to buy his support. He was a member of the Continental Congress, a signer of the Declaration of Independence and, after the war, governor of Massachusetts. He died at Boston, Oct. ?, 1803. See Hosmer's *Life* in *American Statesmen Series.*

**Adams, Wm. Taylor,** better known as "Oliver Optic" (1822–1897), was a native of Massachusetts, a school teacher in Boston, and a popular writer of tales for the young. Among the best known of his works, of which he is said to have written over 100, are the *Starry Flag Series*, and *Young America Abroad.*

**Adams, Mass.,** a city in Berkshire, county, on Hoosac River, includes the villages of Maple Grove, Zylonite, Renfrew. Greylock Park (state reserve) contains Greylock Mountain, the highest point in the state. It manufactures paper, cotton and woolen goods, does foundry work, etc., and has a public library. Population 13,026.

**Addams (Miss) Jane,** a philanthropist and social settlement worker, born in Cedarville, Ill., Sept. 6, 1860. She graduated from Rockford College in 1881, studied two years in Europe, 1883-85, and later studied in Philadelphia. In 1889 she opened Hull House, a social settlement institution in Chicago, and is still the head of that institution. She has written and lectured extensively on social and political reform. She is the author of *Democracy and Social Ethics.*

**Adder.** See VIPER.

**Adder's-Tongue,** or dog-tooth violet, is a wild flower fond of brookside and moist wood. It belongs to the lily family, is called by many a child the "yellow lily." The plant has two lance-shaped spotted leaves, bears but a single blossom. The flower will turn on its stalk to follow the sun. Its name is not considered appropriate; change to fawn lily has been suggested, also to trout lily. It is one of the earliest spring flowers. From Nova Scotia to Florida it is found, and west to the Mississippi. The white adder's-tongue is more common in the west than in the east.

**Ad'dison, Joseph,** a great English essayist, was born in 1672, graduated at Oxford, and held for some years a fellowship at the University. Here some of his early writings brought him into notice and secured him a pension of $1,500 a year. Gaining this, he traveled on the continent, observing, studying and writing. In the winter of 1701, amid the stoppages and discomforts of a journey across Mt. Cenis, he composed his *Letter from Italy*, which contains many fine touches of description and is by far the best of his poems. At the death of King William his pension was stopped, and having no means of his own his prospects were gloomy indeed, till a lucky chance put him on his feet again. The ministry desired a poem written in praise of Marlborough, who had just won the battle of Blenheim. Addison wrote the poem, *The Campaign*, and was rewarded with the office of excise commissioner. He held other public offices, which kept him from writing much for the next six years. In 1710 he began to bring out his famous essays. These he contributed to the *Tattler*, next to the *Spectator* and afterwards to the *Guardian*, which he published in conjunction with his friend Richard Steele. The most successful of these periodicals was the *Spectator.* It was a daily paper, but without any news. It took the fancy of Londoners at the time, and though it only ran a few months has been renowned ever since. Addision died in 1719. See Courthope's *Addison*, in *English Men of Letters Series.*

**Address, Forms of,** the titles or ceremonious terms to be used in addressing written communications to people of high or official position. Usage in this country has sanctioned the employment of the following modes of address: *His Excellency, The President of the United States.* Custom has also made proper the use of the prefix *His Excellency* when addressing governors of states and ambassadors or ministers of the United States abroad. In conversation, or in formal oral address, the term *Mr. President* is used by all to the head of the nation, save by the President's personal or intimate friends. The Vice-president is addressed by letter as *The Honorable, The Vice-president of the United States*, or *The Hon. —— ——, Vice-president of the United States.* When the latter is acting as *ex-officio* presiding officer of the Senate he is addressed by the senators as *Mr. President.* Cabinet officers, senators and representatives of the United States, judges of state and federal courts and consuls are all entitled to the prefix *Honorable*, as *The Hon. Senator A. B. Clark; The Hon. Mr. Justice*, or *The Hon. Judge Jones.* Custom also permits the use of *Honorable* to mayors of cities, as *The Hon. Mayor Smith*, or *The Hon. Lionel Smith, Mayor* of the city of ——.

For church dignitaries the terms of address vary somewhat with the denomination. In the Protestant Episcopal church the bishop is addressed *The Right Rev. ——;* in the Methodist Church as *The Rev. Bishop ——*. Clergymen take the title *The Rev.* or simply *Rev.*, adding any collegiate degrees to which they may be entitled, such as M.A., D.D., LL.D., etc., or in the case of a clergyman who has a doctorate degree he may be addressed simply: *The Rev. Dr. ——*. It is bad form, it may be added, to speak or write of a clergyman as *Rev. Jones, Rev. Smith*, etc. If his Christian name is not known, use invariably the prefix *Mr.* (Mister), as the *Rev. Mr. Jones*, etc. Archbishops are addressed: *The Most Rev. —— ——*, D.D. (or whatever degree possessed of); while cardinals are addressed *His Eminence —— ——*. Physicians and surgeons are addressed: *Dr. —— ——*, or *Thomas Jones, Esq., M.D.* Lawyers or private gentlemen may be addressed either *—— ——, Esq.*, or plain *Mr. —— ——*.

Where husband and wife are both addressed, it is proper to give the title of the former, followed by the word Mrs., using the given name or initials of the husband; thus: *His Excellency, the President, and Mrs. McKinley; Governor and Mrs. Jonas Smith;* or *The Hon. and Mrs. J. L. Jones.* In the case of scholastic titles or those conferred by universities they usually precede the name, thus: *Prof.* Harry Jones; *Dr.* Walker Brown, or may follow the name, thus: Goldwin Smith, Esq., *D.C.L.* (Doctor of Civil Law), or *—— ——*, Esq., *LL.D.* (Doctor of Laws).

**Ade, George,** humorous writer and playwright, was born at Kentland, Indiana, in 1866. He was educated at Purdue University and did newspaper work in Chicago, where his *Stories of the Streets of the Town* brought him into notice. His *Fables in Slang*, two volumes appearing in 1901-02, gave him wide reputation for pungent and satirical wit. His musical comedies, *The Sultan of Sulu* and *Peggy from Paris*, appeared in 1903. Later works are *The County Chairman, The College Widow* and others.

**Adelaide** (*ad'e-lād*), situated about six miles from St. Vincent's Gulf, is the capital of South Australia. The Torrens River divides it into North and South Adelaide. It is surrounded by hills, has large manufactories, and exports especially copper and gold. It is the seat of the University of Adelaide, incorporated in 1874, and authorized to grant degrees in arts, law, music, medicine and science. Port Adelaide, at the mouth of the river, is the principal port of South Australia. Population, with suburbs, 184,393.

**A'den,** a British Protectorate on the Arabian Coast, about 100 miles east of the Straits of Bab-el-Mandeb, at the southern entrance to the Red Sea. Besides the town and port, which are strongly fortified and are used as an important coaling station for British vessels on the way to India *via* the Suez Canal and the Red Sea, the region embraces a protectorate, consisting of a large slice of the Arabian hinterland (area, about 9,000 square miles), arranged in 1905 by Commissioners of the Ottoman and British Governments. This protectorate, which includes Aden, the Island of Perim and the Aden Hinterland, is administered by a political resident of the British Government and made subject to the Government of Bombay, India. In 1911 its population was 46,165. Its trade is almost purely a transhipment one, except that from the interior of Arabia, which consists of coffee, gums, hides and skins. The peninsula on which Aden stands is volcanic, but the climate is healthful, though there is little rainfall, which is unfavorable to agriculture, which, it may be said, hardly exists. In early days Aden was used by the Romans as an entrepot for the empire's trade with the east. Subsequently it came under Portuguese and Ottoman rule, and in 1839 it was taken from the Turks by Britain.

**Adirondacks** (*ăd-ĭ-rŏn-dăks*), a group of mountains in northern New York, lying between Lakes Champlain and Ontario. They rise from a large tableland to about 2,000 feet above the level of the sea, and are chiefly of granite formation. Mt. Marcy, the highest summit, is 5,370 feet high. The forests, especially the white pine, are very valuable. The scenery and abundant game of these mountains have made the region a popular resort for tourists and sportsmen. The state of New York has constituted a forest reserve or park in this district, comprising 2,807,760 acres, an area larger than the state of Connecticut. A large force of men is employed to guard against forest fires, enforce the law against illegal fishing and hunting, and to act as guides. A sanitarium for the treatment of consumptive patients is located at Saranac Lake.

**Ad'jective** (Latin *ad+jacere*, to add to; to throw out), is a word used in grammar to describe, qualify or limit the meaning of a noun or a pronoun; as a wise man, a good book, a lovely flower, a true story, a happy child, a weariful day. These are called descriptive adjectives, since they express some property or quality possessed by the noun. There are also limiting adjectives used to express number or quality, such as the indefinite article *a* or *an*, and the definite article the, this, one, first, some, much, etc. Not a few of these are used like pronouns, and are termed adjective pronouns; some of these are: all, any, each, few, many, such, several, etc. Descriptive adjectives are sometimes, by

ellipsis, used as nouns; so used, the adjective when it denotes persons is taken in the plural sense, and is usually preceded by *the*, as "The poor deserve sympathy." Adjectives are used comparatively, when we desire to indicate that one thing possesses a given quality in a higher degree than another. There are three degrees of comparison—the positive, the comparative and the superlative, as exemplified thus; sweet (positive), sweeter (comparative), and sweetest (superlative). Other examples are, tall, short, warm, cold, great, small, rare, fine, etc.—the comparative being expressed by adding *er* and the superlative by adding *est* to the positive. Degrees of quality are also expressed by prefixing to the positive the adverbs *more* and *most*, *less* and *least*—as cheerful, more cheerful, most cheerful; amiable, less amiable, least amiable. When two qualities in the same person or thing are compared, or when the adjective we want to use follows its noun, the following is the mode of usage: He is more wise than honest. In the English and German languages the usual place of the adjective when it is not in the predicate is before the noun. For examples of phrase-adjectives and other uses of the adjective see any good textbook on grammar.

**Ad′jutant,** a large stork found in tropical India, by the English given the soldier name because of its erect attitude and solemn manner of stalking about. *Argala* is the native name. It is of great size, sometimes six feet high and fourteen feet in expanse of wings. Its beak is very large;

ADJUTANT-BIRD

it sometimes catches crows and other birds on the wing, and is able to swallow a kitten, fowl or leg of mutton, but its usual food is offal, lizards, etc. It frequents the neighborhood of slaughter-houses and the burning-grounds of the Hindus. It is so useful as a scavenger that in some places in India it is protected by law. It is greenish-black above and white below. The head and neck are bare or provided with a few scattered hairs, the legs long and naked. At the lower part of the neck is a peculiar air-pouch which is also bare; it is inflated during flight. The beautiful marabou feathers used in trimming ladies' hats come from the tail of the adjutant and also from the closely related marabou stork of Africa. The adjutant is said to utter a loud grunting croak or bellow.

**Ad′ler, Felix,** writer and lecturer, the son of a Hebrew rabbi, was born at Abzey, Germany, in 1851. His education has been chiefly American, but he is a Ph.D. of Berlin University. In 1874–6 he was professor of oriental languages and Hebrew at Cornell University. This post he resigned to lecture before the Ethical Culture Society. His lectures before this society on Sundays in New York are well known and attended. Dr. Adler was called in 1902 to be professor of social and political ethics in Columbia University. He is the author of *Creed and Deed* (1878) and *The Moral Instruction of Children* (1892).

**Ad′oles′cence.** The word adolescence is used to designate the period of transition from childhood to adult life. It is the period beginning just before puberty, and lasting till the age of maturity. It may be conveniently divided into two stages: (1) that of *early adolescence or pubescence*, beginning at the age of eleven or twelve in girls, and thirteen or fourteen in boys, and lasting till about the age of sixteen or eighteen; (2) that of *late adolescence*, from sixteen to twenty-one in girls and eighteen to twenty-five in boys.

There is, of course, continuity throughout the whole development of an individual, and lines of demarkation cannot be too rigidly drawn, or characteristics of special periods too strongly emphasized, particularly as the nature of development varies considerably with different persons; but there are certain well marked features of adolescence with which teachers and parents as well as adolescents themselves should be familiar.

After the somewhat slow period of growth of later childhood there is, at the beginning of pubescence, a sudden shooting up in height, closely followed by a rapid increase in weight. In both boys and girls the body now begins to assume the adult form, and the pronounced sex differences appear. In boys the beard begins to grow, and the voice changes and deepens, the rapid growth of the larynx making accurate control of the vocal organs for a time impossible. Boys often exhibit, and are sensitive to, awkwardness in the management of their overgrown bodies. Latent capacities and interests develop, the features change to show new characters, and hereditary influences become more pronounced.

The essential characteristic of pubescence is, of course, the unfoldment of the functions pertaining to sex, with their accompanying instincts and impulses. The youth suddenly finds himself strangely sensitive to the charms of the opposite sex and strongly susceptible to its influence. A new interest in dress and the care of the person usually develops, and often a tendency to show off, on account of the newly awakened regard for the good opinion of persons of the opposite sex. These sex instincts, like all other instincts, should be properly directed, strengthened or inhibited in view of their future function on the one hand and the danger of perversion on the other.

The more distinctly mental and emotional traits of this period are, perhaps, more variable than the physical ones, but scarcely less pronounced. In thought and feeling, as well as in appearance, the boy becomes specifically masculine and the girl feminine. It is a time of great increase in mental and emotional vigor, of tremendous enlargement of the sphere of interests and broadening of the mental horizon. The beauties of nature, of poetry and of art begin to appeal, and the soul can be profoundly stirred by religious and ideal sentiments. The youth comes to look upon himself in the light of his larger relations to the race and to society, and to attempt a personal readjustment to the larger view of life thus opened up. Intellectually he becomes capable of comprehending broader generalizations and larger thoughts. In many it is an epoch marked by great emotional instability. Periods of enthusiastic energy and noble attempt at high achievement often alternate with periods of languor, depression and doubt.

The stage here gradually shades off into that of late adolescence. Late adolescence is essentially a time of fixing the framework of the personal habits, ideals and relationships of life. It is normally a time of choosing a life profession and of taking the initial steps toward entering upon it. It marks the transition from a state of dependence upon others in matters material and intellectual to one of independence, showing itself in the development of a characteristic personality capable of thinking and acting as such. Outbreaks against restraint and authority often seem to occur almost instinctively at this period and should be dealt with sympathetically by parents and teachers. Much needless and harmful friction and misunderstanding are caused by the failure of adults to comprehend the real nature and cause of these outbreaks. In many this emerging personality is subject in turn to periods of emotional exaltation of self-consciousness with abundance of self-confidence, and periods of distressing depression and doubt, with feelings of total inability to cope with the complexity of the problems opened up by this wondrous new birth.

With some, this ebb and flow of feelings connected with the emergence of the new sense of one's distinctive personality give rise to a great deal of needless anxiety. Largely on this account later adolescence has been called a stress and strain period. Those who do not manifest this extreme emotional instability are fortunate. Those who do should be led to see that these feelings in themselves are of no consequence, but merely accidental accompaniments of certain physiological changes, and that vague fears for the future are groundless and harmful.

Professor James' words of encouragement in this connection have been so inestimably helpful to many adolescents that they are here quoted at length: "Let no youth have any anxiety about the upshot of his education, whatever the line of it may be. If he keeps faithfully busy each hour of the working day he may safely leave the final result to itself. He can, with perfect certainty count on waking up some fine morning to find himself one of the competent ones of his generation in whatever pursuit he has singled out. Young people should know this truth in advance. The ignorance of it has engendered more faint-heartedness in youths embarking upon arduous careers than all other causes put together."

The practical problem for the educator during the whole period of adolescence is to recognize the new interests, emotions and impulses as they emerge, and to provide for them suitable outlet in action. The confidence that later adolescents are willing to repose in sympathetic adults who understand their needs and the longing that they feel for adequate counsel and adult companionship render them peculiarly susceptible to wise guidance, and make possible at every stage a gradual transition—an evolution rather than a catastrophic revolution, as is too often the case.

B. R. Simpson.

**Adolph'ustown,** a town in Prince Edward County (north shore of Lake Ontario), in Eastern Ontario. The United Empire Loyalists first landed at this point June 16, 1784. To commemorate this event an important centennial celebration was held at Adolphustown in June, 1884, at which were present the Lieutenant Governor of the Province (John Beverley Robinson), and other notables. The settlement of Upper Canada (now Ontario) began in 1784 by the arrival of the Loyalists. When the American colonies revolted in 1776 and declared their independence many of the colonists opposed the movement and aided the imperial troops during the war. These were known as the United Empire Loyalists. The war being over, many of them moved and made their homes in the territory known as New Brunswick and Nova Scotia. Others crossed the Niagara River, or settled

on tracts along the St. Lawrence. A considerable part of the present population of Ontario is descended from these pioneers. In 1784 the total white population of the Province of Ontario did not exceed 20,000. A well known writer says "The event of the Pilgrim Fathers at Plymouth, so praised in prose and verse, was a holiday excursion compared with the arrival of the expatriated Loyalists."

**Adonis** (*a-dō'nis*), a very beautiful youth celebrated in Greek mythology. The goddess Venus loved him for his beauty, and hid him in a chest, which she intrusted to Proserpine, the goddess of the lower world. A dispute arose between them for his possession, and Jupiter decided that each should enjoy his presence for half the year. Adonis was fond of hunting, and was finally killed by a wild boar in the forests of Ida. The bitter lament of Venus for his loss moved the gods to permit the youth to return to the upper world for six months in every year. A yearly festival in honor of Adonis was given in the countries bordering on the Mediterranean, and consisted of two parts—a mourning for his departure to the underworld, and a rejoicing for his return to Venus. Adonis is believed to be the sun, and his stay in the upper and lower worlds to represent the changes of winter and summer.

**Adrian** (*ā'dri-an*), the name of six popes. Adrian IV, the only English pope, was named Nicholas Breakspeare. He left England a poor man, went to Paris, became an ardent student, and was soon known for his learning and zeal. He was chosen abbot, then cardinal, and lastly pope in 1154. He was vigorous in maintaining his authority at Rome and throughout Europe. He died in Italy in 1159.

**Adrian,** a city, the county seat of Lenawee County, Mich., on the Raisin River, and on the New York Central, Wabash, Detroit, Toledo and Ironton Railways, thirty-two miles from Toledo, Ohio, and sixty miles southwest of Detroit. It is the seat of Adrian College (Meth. Prot.), the State Industrial Home for Girls, and St. Joseph's (R. C.) Hospital and Academy. It has a considerable agricultural trade and many important manufactures, woven wire fence, underwear, piano and organ factories, steel and electrical works, four banks and daily and weekly newspapers. Population, 10,763.

**Adriano'ple** (*ăd-ri-an-ō'pl*), meaning the city of Hadrian, is a city of European Turkey. It is next to Constantinople in importance, though not in population. The streets are narrow, crooked and filthy; its ancient citadel and the walls which formerly surrounded the town are now in ruins. It was called Uskadama till renamed by the Emperor Hadrian. In 1360 it was captured by the Turks, who made it their capital for almost a hundred years, or until they came into possession of Constantinople. It has also been twice taken by the Russians, in 1829 and in 1878. Population, 83,000.

**Adriatic** (*a-dri-ăt'ik*) **Sea,** is an arm of the Mediterranean, which separates Italy from Trieste, Croatia, Dalmatia and Albania. Its greatest length is 450 miles and its mean breadth 90 miles. The Po is the most important river flowing into the Adriatic Sea, and the chief cities bordering it are Venice, Trieste, Ancona and Brindisi. In 1177 Venice gained a victory on the Adriatic over Otho, the son of Frederick Barbarossa, whereupon the pope gave the doge a ring and instituted the famous ceremony of marrying the Adriatic.

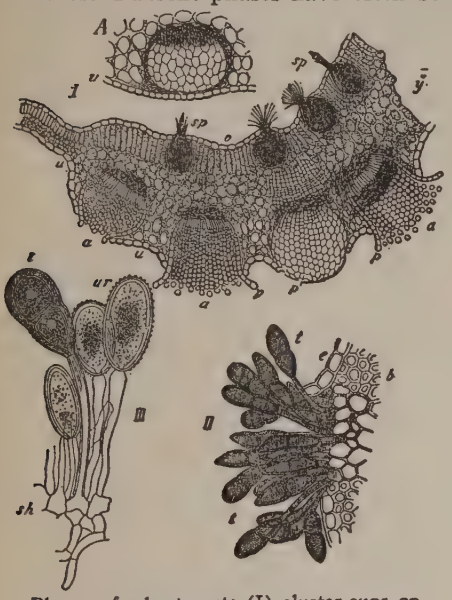
**Adul'tera'tion of Foods,** any changing of a food for the purpose of deceiving the purchaser. The term includes, for example, the mixing of cheaper substances with the food so as to increase the amount of profit from its sale, the mixing in of preservatives and materials calculated to improve the appearance of partly spoiled food, the extraction of cream from milk, etc.

The practice is, no doubt, as old as trade, and has frequently been legislated against by all civilized countries. At the present time the laws against it throughout the greater part of Europe are stringent and usually enforced. The laws in the United States concerning adulteration are carefully drawn, but it has not always been possible to enforce them. Recently a law of national scope has been passed, which requires that the wrapper of any food shall have upon it a statement of the exact contents, including preservatives.

**Ad'verb** (Latin *adverbium*, from *ad*, to, +*verbum*, word, verb). In grammar, an adverb is a word used to modify the meaning of a verb, an adjective or another adverb. It is essentially "the word" of a sentence, and has a number of functions, in showing how, where and when a given action is performed, besides its general use as a modifier. Adverbs are classed as follows: (1) those of place, used in answering the questions Where? Whence? Whither? Of these the following are some examples: here, there, when, forth, far, etc; (2) those of time, answering questions When? How often? How long? Ex: once, ago, always, seldom, now, then, etc.; (3) those of manner, answering the question How? Ex: then, so, how, well, fast, chiefly, wholly, slowly, etc. Many of this class are derived from adjectives by adding *ly;* (4) those of degree, answering the question How much? Ex: less, least, enough, more, most, scarcely, etc.; (5) those of cause, answering the question Why? Ex: hence, wherefore, therefore, consequently, accordingly, etc. When used to ask questions, these adverbs of the various classes are termed interrogative adverbs. The words soon, away,

sometimes, often, are used *only* as adverbs; while other words, such as early, late, fast, etc., are sometimes adverbs and sometimes adjectives, according as we use them. Many adjectives become adverbs by adding *ly*, as violent, violently, swift, swiftly, slow, slowly, etc. A few adverbs, like adjectives, are compared, such as soon, sooner, soonest; often, oftener, oftenest; long, longer, longest, etc.; some also are compared by the use of the adverbs more and most, less and least. Ex: wickedly, more wickedly, most wickedly; quickly, less quickly, least quickly. For other details and examples in the use of adverbs see any good text-book on grammar.

**Æcidiomycetes** (*ē-sĭd'ĭ-ō-mī-sē'-tēz*), the technical name of a large group of plants commonly known as "rusts" and "smuts." They are very destructive parasites and attack some of the most valuable crops. The rusts chiefly attack the leaves of the higher plants, producing rusty lines and dots; while the smuts chiefly prey upon the grasses and are very injurious to cereals, attacking the grains of wheat, corn, oats, barley, etc. These parasites are very polymorphic, that is they assume different forms at different periods in their life histories, and these different phases have often been



Phases of wheat rust: (I) cluster-cups on barberry (lower side); (II) winter spores (teleutospores) on wheat; (III) summer spores (uredospores) on wheat.

described as different kinds of plants. The history of these parasites is often further complicated by the fact that in their different phases they may live on different plants (hosts). Great attention has been paid to these destructive forms by the national and state governments, in the hope that some way may be discovered by which their destructiveness may be lessened. The wheat rust is one of the best known forms, and its life history may serve as an illustration of the whole group. When the wheat is growing, rusty lines and dots appear on the leaves and stalk. These spots are known as the "red rust," and are masses of spores which have come to the surface, and are called "summer spores" or "uredospores." (III *ur.*) They arise from the threadlike body or "mycelium" of the parasite, which is imbedded out of sight among living cells of the wheat body and is feeding upon them. These summer spores are easily scattered by the wind, and falling upon other wheat plants germinate, enter the body. and begin to feed upon it. By means of the summer spores, therefore, the rust disease is spread rapidly during the growing season. In the late summer and fall black lines and dots appear upon the wheat stubble, forming the so-called "black rust," being masses of peculiar spores called "teleutospores" or "winter spores," because they last through the winter. (II, *t.*) These teleutospores come from the same mycelium (white threads) which produced the summer spores, and are the last spores it produces. Early the following spring the teleutospores germinate and form a little filament which produces very minute spores called "sporidia." These sporidia are scattered by the wind, and falling upon barberry leaves they germinate, the mycelium entering the leaf. This new mycelium sends to the surface of the leaf, especially the under surface, masses of orange-colored spores in little cup-like clusters, which are called "cluster-cups," or each is technically called an "æcidium." (I, *a.*) These æcidium spores from the barberry are carried by the wind to the young wheat, where they germinate and produce the mycelium with which we started. In case the barberry is not present to be used as a host for the æcidium stage this stage is omitted, and the sporidia pass directly to the wheat and germinate. There are thus three distinct phases in the life history of this plant, at least four kinds of spores, and two host plants, the sporidium phase not being a parasite. See FUNGI.

JOHN M. COULTER.

**Æcidium** (*ē-sĭd'ĭŭm*). See ÆCIDIOMYCETES.

**Ægean** (*ē-jē'ăn*) **Sea,** an arm of the Mediterranean between Greece and Asia Minor, is now called the Grecian Archipelago. One fable traces its name to Ægeas, king of Athens, who threw himself into its waters. It is over 400 miles in length, with an average breadth of 200 miles. It is studded with islands, many of which have played an important part in Grecian history.

**Æneas** (*ē-nē'ăs*), a Trojan warrior and hero of the *Æneid*, the great epic poem of

Vergil; the son of Anchises and the goddess Venus he married Creusa, the daughter of King Priam. After the sack of Troy he left the city, carrying his father on his shoulders and leading his son Ascanius. Building a fleet, he set sail with a few chosen companions, but was shipwrecked on the coast of Africa, near Carthage. He was received kindly by Queen Dido, whom he would have married had he not been warned by the gods to seek Italy. On setting out thither, his ship, as it left port, was lighted by the funeral pyre of Dido, who had killed herself in grief at his departure. After celebrating the national games on the coast of Sicily in honor of Anchises, who had died there, and paying a visit to the lower world, where the future was unfolded to him, Æneas reached the Tiber. He was received by King Latinus, whose daughter he married. He fell in battle with the Etruscans, and after his death received the honors of a god. His son Ascanius or Iulus founded Alba Longa, one of whose kings, Numitor, was the grandfather of Romulus, who founded Rome. Hence the Romans claimed to derive their origin from Æneas.

**Æolian** (*ē-ō'lĭ-an*) **Harp,** a musical instrument named from Æolus, god of the winds. It is made by stretching catgut strings or wires over a thin sounding box. The strings are tuned as in a violin. When placed in a partially closed window, where there is a draught, the passing of the wind over its strings produces strange and melancholy musical sounds, varying with the force of the wind.

**Æolus** (*ē'ō-lus*), the mythical god of the winds. He is said to have ruled over the Æolian islands, now the Lipari group in the Tyrrhenian sea. Here he kept the winds shut up in a cave, loosing them and calling them back at the command of Neptune.

**A'era'tion** (*ā'ĕr-a'shŭn*) (in plants). Plants, like animals, respire (see RESPIRATION); therefore, air (oxygen) must reach all the living cells, and carbon dioxid must be got rid of. Green plants also need to absorb carbon dioxid and to get rid of oxygen in the process of food-making (see PHOTOSYNTHESIS). To permit these gaseous exchanges in the larger plants the cells partly separate as they mature, leaving irregular passages, which usually open to the outside by numerous slits, each bounded by two guard cells and called stomata. The air does not flow in mass through these orifices and passages, but the insensible movements of diffusion suffice. This aerating system also permits the evaporation of water by land plants (see TRANSPIRATION). Naturally the aerating system is best developed in the larger water-plants, where the great canals can be seen with the naked eye.

**Aeronautics** (*ā-er-o-naw'-tiks*) or **Aerial Navigation.** It seems to be a fixed principle of nature that every kind of animal as well as every individual animal must work out its problems in an individual way. As man learned to navigate the water, not by building an artificial fish—although he borrowed valuable ideas from the fish—so he finally learned to navigate the air, not by building an artificial bird as he originally tried to do, but by devices suited to the machinery of his body and the adaptation of some of the machinery and methods of both the bird and the fish. While the "bird man" uses wings—biplanes and monoplanes—he does not use them to drive himself forward as the hawk does, for example, when flying, but to keep himself in the air as the hawk does when he hovers over the chicken lot. For the tail of his flying machine the "bird man" has used, as we shall see, the tail feathers of the bird in the horizontal rudder and the tail fin of the fish for his vertical rudder. At the same time that he was borrowing ideas of the bird and the fish he carried these ideas out with machinery borrowed from his fellow travelers on land and water. Look at the picture of the Bleriot monoplane and see if you cannot find the ideas borrowed from the sled, bicycle and automobile—the horizontal rudder, like the tail of a bird, the upright rudder (marked 22) like the fin of a fish, and the gas engine in the heart of the machine, surrounded by its radiator, like the radiator of an automobile; and, finally, the propeller borrowed from the screw propeller of the steamship—itself probably first borrowed from some little boy with a whirligig, in Egypt or Assyria centuries upon centuries ago!

Just as little boys do, men usually learn to do things right by beginning to do them wrong. The story of Daedalus (q. v.) simply expresses the fact that man's original idea about flying was to make himself wings like a bird. Next he tried—and succeeded—in floating through the air by means of a balloon—a big ball filled with gas, just like a child's toy balloon, with the difference that it had a net over it and a basket hanging from this net in which men could ride and carry scientific instruments for measuring the temperature and moisture of the air and learning other things of interest and importance to science.

It was on June 5, 1783, that Stephen and Joseph Montgolfier, paper makers of Annonay, France, launched the first balloon, of which they were the inventors.

Balloons anchored to the ground by ropes are still used for military observation, but the most important form of the balloon flying machine is what is known as the dirigible, in which the gas which holds it up is contained in a series of separate bags in a cigar-shaped frame like the water-tight compartments of a ship. It is propelled and guided by machinery similar to that of an aeroplane.

THE DIFFERENT KINDS OF AIRSHIPS

Airships are divided into two classes — the

aeroplanes, or machines that are heavier than air, and the dirigibles, which are lighter than air. Aeroplanes are again divided into two classes, the monoplanes, which have one set, and the biplanes, which have two sets of wings. A hydro-aeroplane is a machine that can swim in the water as well as fly through the air. There is only one thing the bird can do—a duck, for example—that man has as not yet done; for the duck can fly over the water, swim on the water and dive under the water; but no machine "bird" has yet been invented that will do all these things. The submarine (q. v.) can swim on the water and dive under the water but cannot fly.

Of the dirigibles the Zeppelin—the invention of a German count—is the best known; and, like the aeroplanes, has found its most extensive use in war. The Zeppelins are really immense "battleships of the air," rigid in construction, metal covered, armed with machine guns, equipped with wireless apparatus and searchlights, are from 485 to 550 feet in length, with a horse power varying from 450 to 1,080, are capable of a speed of 40 miles against, to 94 miles an hour with the wind; can stay up from thirty-five to forty hours; carry a crew of twenty men, provision and fuel for a 3,000 mile journey, and a large quantity of explosives.

### HOW THE FLYING MACHINE PROBLEM WAS SOLVED

Following important, though unsuccessful, experiments by Maxim in England and Langley in America, Wilbur Wright and his brother, Orville, after years of study and experiment, produced an aeroplane which was first successfully operated near Dayton, Ohio, in 1905.

The power in the Wright and other aeroplanes is controlled by a lever similar to that of a locomotive; but this lever has a right and left motion by which the planes, or wings, which are flexible, can be tipped at the outer end so as to counterbalance adverse air currents just as a bird tips his wing to balance himself against the wind.

The vertical rudder with which the machine is guided to the right or left is controlled by a special arrangement on the power lever. The horizontal rudders with which the "bird man" steers his flight up or down and checks himself, preparatory to lighting—just as a bird does—is controlled by a separate lever. The machine is mounted on two long runners which support the horizontal rudder when the machine is running along the ground.

The hydro-aeroplane combines the flying machine with a little boat on wheels. With the wheels it runs along the ground when lighting on land or rising for flight. The boat, with the help of two cylinders filled with air at either end of the lower of its two planes, keeps it afloat in the water.

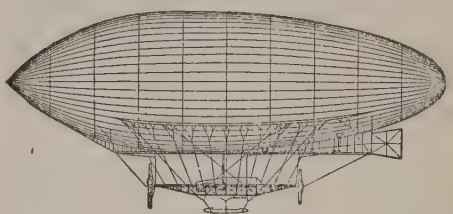
A very important step in connection with aviation was the granting of an American patent in 1913 to the Wright Brothers for a stabilizer for maintaining automatic control—a kind of mechanical brain. To prevent the tipping of the wings by a sudden puff a pendulum is connected with a motor; while, to prevent sudden swerving up or down, there is a horizontal rudder actuated by a small plane mounted at a different angle from the main aeroplane so that, whenever there is a sudden change in the position of the machine, the horizontal rudder restores it to its proper position.

### COMPARATIVE ADVANTAGES OF DIRIGIBLES AND AEROPLANES

The European War gave a tremendous impetus to the construction and use of both aeroplanes and dirigibles, and demonstrated their relative advantages.

While Zeppelins have the advantage over the smaller craft that they can carry a larger number of men and a larger supply of explosives, the value of both the biplane and the monoplane is in their use for scouting and for the direction of gun fire. War aeroplanes are broadly divided into three types, (1) those for chasing and fighting, (2) for scouting, and (3) for bombardment. The fighting machines are the fastest and quickest climbers but without much flight endurance because of the amount of fuel (petroleum) necessary to be carried. Armed biplanes are built with as high as 150 horse power, and two engines and two machine guns, one pointing forward, one backward. These guns are rigid and are aimed by maneuvering the machine. These machines will travel from 125 to 130 miles an hour.

The air scouts fly 6,000 feet high, hide as much as possible among the clouds and hang



DIRIGIBLE BALLOON

for hours like a hawk in one quarter of the sky. On discovering, for example, the hidden battery of an enemy the scout signals by maneuvers or by dropping tinsel that glitters in the sun or by smoke balls. Knowing the elevation the artillery observer makes calculations by geometry so rapidly that cases are on record of the utter destruction of a battery within thirty seconds of the aeroplane's first signal. For scouting a half dozen aeroplanes are considered worth a division of cavalry. In three and one-half hours an airman can cover a circular area of eighty miles in radius, noting each regiment of infantry, cavalry, squadron or field battery. All cavalry screens, feigned movements and secrecy of the old days of warfare have been swept away. Biplanes for all-around purposes are considered superior to monoplanes. They are also easier to build

and operate and stand better the severe demands of military flying.

Both dirigibles and aeroplanes are used for bombardment, and go in squadrons, flying in single file like a flock of wild geese. Reaching the object of attack, they swoop, each in turn, drop bombs, climb skyward in a zig-zag fashion like a vessel tacking and, making a wide circle swoop down again.

At the beginning of the war there were many types of machines, but the war resulted in the development of fewer types, as the severe test of war eliminated the unfit.

Of course, an army does not permit the enemy's aircraft to spy out its position unmolested, and not only gives chase with its own aeroplanes, but types of guns are especially devised for attacking aircraft.

Zeppelins were used not only in the attack on Antwerp and other cities on the Continent, but in repeated raids on London. The Hague Conference (q. v.) voted to prohibit the discharge of projectiles and explosives from aircraft, while leaving them free for observation purposes; but this provision was not ratified by Germany, France or Italy.

HISTORY OF THE USE OF AIRCRAFT IN WAR

Previous to the European War aircraft had been successfully employed in the Italian-Turco War, in the Balkan War (q. v.), and to some extent in Mexico, both by the Mexicans and by the American army of occupation. The use of both types of aircraft which, in the great European conflict was one of the three most important elements in the revolution of methods of warfare—the other two being the development in heavy portable artillery and the use of submarines—was itself the evolution of experiments almost as old as the invention of the balloon itself.

Since the chief value of flying machines in warfare has proven to be that of scouting and the direction of gun fire, it is of special interest to know that during the Civil War, General Stoneman's direction of artillery fire from a balloon was the first instance of the use of aircraft for this purpose. Balloons were used for similar purposes in the Spanish-American, the South African and the Russo-Japanese Wars.

HOW BIRDS FLY

You know how you feel when you are "walking on air"—when you feel very happy over something. Isn't it a beautiful thought that perhaps our little brothers of the air, the birds, feel just that way most of the time? We may easily imagine they do, for flying is really walking upon the air. A bird can fly, not because he is *lighter* but because he is *heavier* than the air. A bird lighter than air would be carried away into space by even a moderate breeze and he could never get back. A horse's legs and a bird's wings are used for the same purpose and in a similar way. Both the horse with his legs in walking and the bird with its wings in flying describe—isn't it curious—a figure 8; the horse in the forward and backward movement of his feet and the bird in the forward and backward motion of its wings.

No less curious is the fact that the bird is driven forward like a flying machine by a "screw propeller." A distinguished English

WRIGHT BROTHERS AEROPLANE
R, rudder; LR, lifting and lowering rudder; P P, propellers.

scientist, Prof. J. Bell Pettigrew, showed, in a paper read before the Royal Institution in 1867, that all wings, whether of insects, birds or beetles, act essentially as screws owing to the fact that they twist in opposite directions in the up and down strokes. The bird's wings are thus worked like the blades of a whirligig or the propeller of a steamship or a flying machine. And the elytra or wing cases of insects—beetles, for example—are like aeroplanes, for, although the beetle flies with his wings, these wing cases spread out on either side; and as he is flying and carried forward by the motion of his body, help to hold him up like little kites.

Some people still think that the air-sacs of birds help them in flight but scientific investigation has proven that this is not true; so, although the experiments of Santos-Dumont (*q. v.*) helped in the invention of the Zeppelin they did not help in inventing the aeroplane. The bats and some of the best-flying birds have no air-sacs; and you know how hard it is for a light person to walk in deep water. This is because he is not heavy enough to keep his feet on the ground. A bird that has air-sacs does not require such large wings as does a bird of the same size without air-sacs, of course.

**Aerotropism** (in plants). A form of chemotropism (which see) in which oxygen is the directive agent.

**Æschines** (*ĕs' ki-nēz*), a noted Athenian orator, the rival and opponent of Demosthenes. After a varied career, as an actor on the stage and a public speaker of great eloquence, he was exiled and settled in Rhodes. Here he founded a school of eloquence. Three of his orations have come down to us, perhaps the most famous being that *Against Ctesiphon*. He died in Samos 314 B. C., at the age of 76.

**Æschylus** (*ĕs'ki-lus*) (525–456 B. C.), the earliest of the great Attic tragedians. He was born at Eleusis, of a noble family, and took an honorable part in the Persian war. His first efforts at tragedy are said to have been suggested by the god Bacchus, who appeared to him while asleep in the fields. At the age of 41 he won his first prize in the dramatic contests popular among the Athenians, and during his life

WRIGHT IN FLIGHT IN HIS AEROPLANE ZEPPELIN DIRIGIBLE III

BLERIOT MONOPLANE

CURTISS AND HIS BIPLANE

was thirteen times victor. He was finally defeated by Sophocles and went to Sicily, where he lived with Hiero, the tyrant of Syracuse. Tradition says his death was caused by an eagle dropping a tortoise, to break its shell, on his bald head, which the bird had mistaken for a stone. Attic tragedy owes much to Æschylus. He first brought in a second actor, befitting costumes and scenery, and caused a regular stage to be built. He wrote 70 tragedies, of which only seven are now in existence: *The Seven Against Thebes*, *The Suppliants*, *The Persians*, *Prometheus Bound*, *The Choëphori*, and *The Eumenides*. Mrs. Browning's poetical version of *Prometheus Bound* is one of the best of the many translations of his tragedies.

**Æsculapius** (*ĕs-ku-lā'pĭ-us*), in Greek fable, the god of medicine and patron of physicians, called by Homer the Blameless Physician. He was the son of Apollo. He went about healing and raising from the dead until Pluto, god of the lower world, finding his kingdom was losing its people, appealed to Jupiter, who destroyed Æsculapius by a thunderbolt. Various temples were built in his honor. The most famous was at Epidaurus, where a peculiar breed of snakes was believed to have received healing power from Æsculapius. During a pestilence the Greeks used to send for one of these serpents. The Romans also sent a solemn embassy to bring one of these healing snakes to their city, and later introduced the worship of Æsculapius at Rome. The priests of the temples of this god, called Æsclepiades, or sons of Æsculapius, were the only regular physicians of antiquity.

**Æsop** (*ē'sop*), a Greek writer of fables, born about 620 B. C. He was sold as a slave at Athens, but was freed by his master. He gained great reputation as a writer, and was invited by Crœsus, king of Lydia, to live at his court. He was sent by Crœsus, about 564 B.C., to the temple of Apollo at Delphi, where he angered the Delphians by his sarcasm and was thrown from a precipice. His real works have probably been destroyed, the fables which bear his name having been written by later authors.

**Æsthetics** (*ēs-thet'-iks*), a term signifying perceptible to the senses, and denoting the science of the beautiful in nature and the fine arts (Greek, *æsthetikos*). The term æsthetics, though a modern German one, is one which, in its meaning, was familiar to the ancient Greek philosophers, especially to Socrates, Plato and Aristotle. What they meant by the term was the quality in the beautiful that produces to the mind as well as to the eye a certain pleasing effect and a refined pleasure. When we speak of æsthetic ideas, studies or emotions we mean those things that appeal to our sense of the beautiful, or that treat of the expression and embodiment of beauty by art. See Schiller's *Treatise on Æsthetics;* Cousin on *The True, the Beautiful and the Good*, and Alison's essay on *The Nature and Principle of Taste.*

**Ætna, Mount.** See ETNA.

**Afghanistan** (*ăf-găn'ĭs-tăn'*), is a mountainous country of south Central Asia governed by a hereditary monarch called an amir. The present ruler is Habibullah Khan. The government is under the supervision of Great Britain which contributes to it an annual subsidy. It is frequently spoken of as the "buffer state" between British India on the east and Turkistan, the province of Russia to the north of it.

Afghanistan was a part of the empire of Timur the Great and after changing masters several times became independent in 1747. In 1838 the British sent an army into Afghanistan to place on his throne the Amir Shah Shuja who had been driven into exile in India. In 1841 the British suppressed a revolt in Afghanistan and have ever since been the real power there. In 1879 the English resident and his officers and escort were massacred by the Afghans. For this severe revenge and firmer hold were taken by the English. Under the amir there is a council with governors for the separate provinces.

The army comprises about 68,000 foot soldiery, with 7000 horses and 350 guns. The mounted levies are for the most part, the retainers of the great chieftains or of the latters' wealthier vassals.

The population, mainly Mohammedan, is estimated at 5,900,000. It is very mixed and rather discordant in character. The majority are Persians. The Afghans are a brave race; but although apparently frank and openhearted are cruel and treacherous.

The total area (see map of ASIA) is 250,000 square miles. There are practically no navigable rivers and but one railway. Travel on the few high-ways is carried on by camels and ponies. Besides these, the domestic animals are goats, dogs, horses and a few cattle and sheep.

The climate varies greatly from regions where snow never falls to regions where it seldom melts. The trade is mainly with British India. Exports are largely horses, cattle, hides, tobacco, grain, pulse, fruits, vegetables, asafoetida, madder, the castor oil plant, spices, wool; imports, sugar, tea, cotton goods and dyes. There are two harvests: wheat, barley, peas and beans sown in autumn and reaped in summer; rice, millet and corn sown in spring and reaped in autumn. The other principal crops are almonds, pomegranates, figs, grapes, peaches, quinces, cherries, apricots and plums.

The minerals include copper, lead and iron with small quantities of gold and there are precious stones, including *lapis lazuli*. The manufactures include clothes, silks, felts, carpets and various articles made from goat's and camel's hair and sheepskin.

**Africa** (*ăf'rĭ-kă*). A hundred years ago the continent of Africa was almost unknown to the educated world of Europe and North America as regards its vast interior.

WHY AFRICA SO LONG REMAINED UNEXPLORED

Why was Africa the last of the great continents to be effectively opened up? Partly because of the comparative abundance of its negro population, its warlike character and sturdiness of physique, which made it a very serious enemy to the pioneer before the days of machine guns; partly because of the great heat, and most of all, the moist heat of much of Negro Africa, and of the germ-diseases more prevalent there than any other part of the globe; and partly, perhaps mainly, because of the remarkable continuity of the African coastline, the striking absence of those great gulfs, those far-reaching straits or inlets of the sea, those rivers navigable from their mouths upwards for hundreds of miles, which are so prominent a feature in the geography of Asia, Europe, and the eastern side of America. Any far-reaching exploration of the African continent had to be made by land, over a country more savage, less imbued even with the elements of civilization than Asia or America. The navigability of rivers where it was not barred by cataracts or shallows, was choked with a growth of vegetation, the riding animals (horses, asses, oxen) were killed by the bite of the tsetse fly or by some other injected germ disease. All Africa outside the waterless deserts must have seemed to the first pioneers impassable from thickets or forest. In short, it needed tremendous resolution and bravery and all the most recent appliances of civilization before Africa could be conquered for the white man's knowledge. And this result has only been finally achieved within the memory of middle-aged people now living. In 1875 the interior of Africa was still very little known. By 1914 it had been made better known than the interior of Asia or South America.

AFRICA TEN MILLION YEARS AGO

Africa is a sister continent to South America, which it slightly resembles in shape. In the more ancient history of the earth (say ten million years ago), Africa was connected by a land bridge with South America on the one hand, with India, Ceylon, Malaysia, and Australia on the other; while Australia and New Zealand were probably connected with the west side of South America, and South America across Antarctica with Australia. This is virtually proved by the similarity and coincidence of geological formations and the possession of an almost uniform flora in the Mesozoic age. In fact, this great continental belt is sometimes called "Gondwanaland" (from the typical rocks of Gondwana in the Indiana Dekkan) and sometimes the *Glossopteris* Continent, because of the predominant vegetation prevailing at the beginning of the Secondary Epoch. These regions might also be termed the "Diamond" Continent; for all the detached portions at the present day agree in possessing diamonds. Outside their areas no true diamonds are found except some doubtful examples in North America and Scandinavia. It is further interesting to note that the diamonds of South Africa rather resemble in quality and composition those of Australia than those of Liberia (West Africa), which are more akin to the diamonds of India, Guiana, and Brazil. Long after Glossopteris land had been broken up, a land connection subsisted more or less between Tropical Africa and India, and still more, and still later, between West Africa and Brazil. This is the only supposition which will explain the remarkable correspondence in many features between the fauna and flora of Tropical Africa and Tropical America, especially the Brazil-Guiana region and the West Indies.

THE AFRICA OF TODAY

The Africa of today, which has been for two million years or so separated from the great island of Madagascar, extends but little either north or south into the Temperate Zones. It is perhaps the most tropical of the continents, presents the greatest amount of land area to the vertical sun, and is consequently the hottest of the continents. Its greatest length, 5,000 miles, is from north to south, from Latitude 37°20′ N. (Cap Blanc, near Bizerta, in Tunis) to 34°51′ S. (Cape Agulhas, Cape Colony); and its greatest breadth—about 4,000 miles—is from Senegal to the eastern horn of Somaliland. Its total area is about 11,500,000 square miles. The northernmost projection of the continent, Mauretania, is noteworthy, especially in its western portion, for its high plateaus and ranges of lofty mountains, which culminate in the Atlas peaks of Morocco, attaining to more than 15,000 feet in altitude and being under perpetual snow. The Tripolitaine, which lies to the east of Mauretania, is little else than the Mediterranean coast of the Sahara, and consists of ranges of stony hills, low mountains, and arid plateaus, with occasional wastes of shifting sand, and a few depressions known as oases, wherein an easily reached water-supply maintains a comparatively rich vegetation. Egypt is a prolongation of this desert region traversed by the course of the Nile, which in its delta completely banishes the desert and presents us with a region of fertile mud and rich vegetation of a European and Asiatic character. The Sahara Desert region extends with nothing but the interruption of the Nile—and the few miles of cultivated region on either side of the Nile, between the Red Sea on the east and the Atlantic Ocean on the west. Arabia carries on the characteristics of the Sahara to the south of Persia and the northwest of India.

MOUNTAINS AND PLATEAUS

In Eastern Nigeria between the Eastern Niger, the Benue, and Lake Chad, and on the southern frontier of the central Sahara, there are high mountains which may attain to as

EUROPE
ASIA
AFRICA
ATLANTIC OCEAN
MEDITERRANEAN SEA
RED SEA
BLACK SEA
CASPIAN SEA
ENGLAND
FRANCE
SPAIN
PORTUGAL
GERMAN EMPIRE
AUSTRIA HUNGARY
ITALY
RUSSIA
TURKEY
GREECE
ROUMANIA
SERVIA
BULGARIA
MONTENEGRO
MOROCCO
ALGERIA
TUNIS
TRIPOLITANIA
CIRENAICA (BARCA)
EGYPT
LIBYAN DESERT
ARABIAN DESERT
NUBIAN DESERT
ANGLO-EGYPTIAN SUDAN
FRENCH WEST AFRICA
SENEGAL
FRENCH GUINEA
PORTUGUESE GUINEA
SIERRA LEONE
LIBERIA
IVORY COAST
GOLD COAST
DAHOMEY
NIGERIA
KAMERUN
FRENCH CONGO
SOUDAN
ABYSSINIA
ETHIOPIA
BRITISH SOMALI LAND
ITALIAN SOMALI LAND
ERITREA
ARABIA
PERSIA
TURKESTAN
ASIA MINOR
MESOPOTAMIA
PERSIAN GULF
GULF OF ADEN
ENGLISH CHANNEL
BAY OF BISCAY
STRAIT OF GIBRALTAR
TROPIC OF CANCER
LONDON
PARIS
BERLIN
VIENNA
CONSTANTINOPLE
ROME
MADRID
LISBON
CAIRO
ALEXANDRIA
JERUSALEM
MECCA
KHARTUM
ADDIS ABEBA
TIMBUKTU
SOKOTO
KANO
BAGIRMI
WADAI
LAKE CHAD
LAKE NGAMI
LAKE ARAL
MADEIRA IS. (PORT.)
CANARY IS. (SPAN.)
AZORES (PORT.)
CAPE VERDE IS. (PORT.)
ST. MICHAEL
ST. HELENA
SOKOTRA I. (BR.)
CYPRUS (BR.)
MALTA (BR.)
CRETE
CORSICA
SARDINIA
SICILY
BALEARIC IS.
ATLAS MOUNTAINS
SAHARA
NIGER R.
NILE R.
CONGO R.
ZAMBESI R.
EUPHRATES
TIGRIS
VOLGA R.
DNIEPER R.
DANUBE R.
RHINE R.
RHONE R.
DOURO R.
TAGUS R.
ENGLISH CHANNEL
Plymouth
Cherbourg
Havre
Calais
Brussels
Amsterdam
Netherlands
Leipzig
Frankfurt
Breslau
Prague
Cracow
Warsaw
Kiev
Kharkov
Odessa
Crimea
Sebastopol
Sea of Azov
Astrakhan
Tiflis
Trebizond
Erzerum
Tabriz
Teheran
Meshed
Ashkabad
Merv
Bukhara
Khiva
Aral Sea
Amu-daria
Caspian Sea
Turkestan
Nantes
Bordeaux
Toulouse
Marseilles
Genoa
Milan
Venice
Trieste
Florence
Naples
Brindisi
Messina
Palermo
Santander
Oporto
Seville
Malaga
Gibraltar
Tangier
Ceuta
Tetuan
Mazagan
Rabat
Fez
Mogador
Marakesh
Cape Ghir
Cape Juby
Cape Bojador
Cape Blanco
Cape Mirik
Cape Verde
Cape St. Vincent
Strait of Gibraltar
Funchal
Santa Cruz
Las Palmas
Tenerife
Gran Canaria
Lanzarote
Fuerteventura
Ferro
Palma (Span.)
Madeira
Porto Santo
Desertas
Flores
Graciosa
Terceira
Fayal
Pico
Sao Miguel
Sao Maria
Azores (Port.)
Algiers
Oran
Bona
Tunis
Biskra
Batna
Constantine
Kairwan
Sfax
Gafsa
Tebessa
Gabes
Gulf of Gabes
Malta (Br.)
Tripoli
Lebda
Misurata
Mizda
Nalut
Derj
Bonjem
Gadames
Ghadames
Ghat
Murzuk
Zella
Temissa
Fezzan
Sokna
Sella
Fughaa
Gatron
Wau
Tejerri
Derna
Bengasi
Tobruk
Marsa Soluch
Rosetta
Alexandria
Port Said
Damietta
Suez
Cairo
Gizeh
Medinet-el-Fayum
Beni Suef
Minie
Assiut
Girgeh
Esne
Assuan
Kench
Berber
Korosko
Wady Halfa
Abu Hamed
Sennar
Kassala
Gedaref
Gondar
Adua
Antalo
Asmara
Massowah
Aden
Hodeida
Mocha
Jedda
Rabigh
Yambo
Medina
Riad
Hail
Bushire
Shiraz
Ispahan
Kashan
Bagdad
Damascus
Aleppo
Smyrna
Angora
Constantinople
Salonica
Durazzo
Cattaro
Belgrade
Bucharest
Roumania
Servia
Bulgaria
Sofia
Montenegro
Cettinje
Vienna
Budapest
Hungary
Austria
Munich
Stuttgart
Frankfurt
Leipzig
Berlin
Dresden
Breslau
Switzerland
Berne
Lyons
Venice
Milan
Trieste
Florence
Rome
Naples
Brindisi
Messina
Palermo
Sicily
Sardinia
Corsica
Balearic Is.
Algiers
Oran
Bona
Tunis
Biskra
Batna
Constantine
Kairwan
Sfax
Gafsa
Tebessa
Gabes
Gulf of Gabes
Malta (Br.)
Tripoli
Lebda
Misurata
Mizda
Nalut
Derj
Bonjem
G

AFRICA
SCALES
Statute Miles, 575 = 1 Inch.
0 100 200 300 400 500 600 700
Kilometres, 925 = 1 Inch.
0 100 200 300 400 500 600 700 800 900 1000
Rand McNally's New 11 x 14 Map of Africa.
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ON THE SAME SCALE.
Cape Verde Is. (Portuguese)
ST. ANTONIO
SAO VICENTE
SANTIAGO
FOGO
MAYO
BRAVA
PRAIA
SAL
BOAVISTA
ASCENSION (BR.)
ST. HELENA (BR.)
EQUATOR
TROPIC OF CAPRICORN
GULF OF GUINEA
ATLANTIC OCEAN
INDIAN OCEAN
FRENCH GUINEA
PORTUGUESE GUINEA
SPANISH GUINEA
PRINCES I. (PORT.)
ANNOBON I. (SPAN.)
ST. THOMAS (PORT.)
Libreville
Cape Lopez
Ogowe R.
Corisco B.
Castle Bight of Biafra
Mouths of the Niger
Cape Three Points
BELGIAN CONGO
KABINDA
LOANDA
ANGOLA
PORT. BENGUELA
MOSSAMEDES
Gr. Fish Bay
Walfish Bay (Br.)
Hoanib R.
Huab R.
Spencer B.
Angra Pequena
Elizabeth Bay
Orange R.
HOLLAMS BIRD I. (BR.)
GERMAN SOUTH WEST AFRICA
WINDHOEK
KALAHARI DESERT
BECHUANA LAND PROTECT.
BRITISH BECHUANA
CAPE OF GOOD HOPE
UNION OF SOUTH AFRICA
CAPE TOWN
Cape of Good Hope
False B.
Cape Agulhas
Table Bay
Saldanha B.
C. St. Martin
St. Helena B.
Ebenezer
Hondeklip B.
Kamaggas
Steinkopf
Springbok
Warmbad
Bethany
Berseba
Gibeon
Grootfontein
Otjimbingue
Okahandja
Omaruru
Karakobis
Rehoboth
Rosibank
Otavi
OVAMPO LAND
DAMARA LAND
NAMA LAND
KARAS MTS.
KAMIES BERGEN
Hoanib R.
Kuiseb R.
Swakopmund
Walfish Bay
Cape Frio
Mossamedes
Pinda
Wiolle
Humbe
Benguela
Egypto
Novo Redondo
Ambriz
Ambrizette
S. Salvador
Kwanza R.
C. Palmarinyas
Loando
Ambrizette
Bembe
Tembo Aluma
Kabango
Malanzhe
Kimbundu
Katende
Katema
Pebo
Kakenjo
Shintle
Tombe
Bailundu
Kobong
BENGUELA
Bango Akunuko
Humpata
Shibemba
Handa
Lialui
Katongo
Biomo
Sesheke
Kazungula
Victoria Falls
Zambezi R.
Kafue R.
Kabompo R.
Kabompo
Andara
Grootfontein
Gobabis
Otjimbingue
Omaruru
Ghanze
Makarikari Salt-pan
Tati
Pompi
Palapye
Lehuitang
Molopolole
Kanye
Mafeking
Rustenburg
Potchefstroom
Vryburg
Kuruman
Bloemhof
Hopetown
Griquatown
Prieska
Steinkopf
Springbok
Kamaggas
Hondeklip B.
Ebenezer
Saldanha B.
Table Bay
Cape Agulhas
False B.
Cape of Good Hope
Cape Town
Simonstown
Wynberg
Stellenbosch
Worcester
Robertson
Caledon
Swellendam
Mossel B.
George Town
Plettenberg Bay
C. St. Blaize
Knysna
Uitenhage
Algoa Bay
Port Elizabeth
St. Francis Bay
Cape Recife
Port Alfred
Grahamstown
Bathurst
East London
Queenstown
Butterworth
Tsolo
Umtata
Kokstad
Durban
Pietermaritzburg
Bloemfontein
Winburg
Ladybrand
Thaba Nchu
Harrismith
Ficksburg
Wepener
Aliwal North
Colesberg
Cradock
Graaff Reinet
Richmond
Middelburg
Beaufort West
Fraserburg
Victoria West
Prieska
Hopetown
Griquatown
Kuruman
Vryburg
Potchefstroom
Mafeking
Rustenburg
Pretoria
Johannesburg
Heidelberg
Vereeniging
Standerton
Volksrust
Newcastle
Dundee
Ladysmith
Colenso
Estcourt
Howick
Pietermaritzburg
Tugela R.
St. Lucia B.
St. Lucia L.
Zululand
Natal
Basutoland
Orange Free State
Transvaal
Swaziland
Lourenco Marques
Delagoa Bay
Inhambane
Beira
Chinde
Quilimane
Mozambique
Angoche
Mossuril
Antonio Enes
Ibo
Cape Delgado
Almadra Is. (Br.)
Providence I. (Br.)
Cosmoledo Is. (Br.)
Farquhar Is. (Br.)
Gr. Comoro
Gloriosa Is. (Fr.)
Comoro Is. (Fr.)
Mohilla I. (Fr.)
Pomba I.
Johanna I.
Gr. Minow I.
Nossi Be
Diego Suarez
Amboanio
Fernao Veloso B.
Antalaha
Andravoriela
Antongil Bay
Tromelin I.
Cargados Carajos Shoals
Mauritius (Br.)
Port Louis
Reunion (Fr.)
St. Denis
Mascarene Islands
Madagascar
Antananarivo
Tamatave
Andevoranto
Vatomandry
Mahanoro
Masindrano
Matatane
Ambahy
Angalidrano
Manambondro
Masikoro
Pt. Barrow
Fort Dauphin
Cape Ste. Marie
Manambovo R.
Mozambique Channel
Seychelles (Ba.)
Amirante Is. (Br.)
Admiral Is. (Br.)
Madisha (Mogdishu)
Barawa
Merka
Kismayu
Port Durnford
Manda B.
Formosa B.
Malindi
Mombasa
Witu
Nairobi
Kikuyu
Kisumu
Entebbe
Mumias
Niemps
Borari
Kavirondo
Victoria Nyanza
Albert Nyanza
Albert Edward Nyanza
Kivu L.
Bukoba
Ruwenzori
Stanley Falls
Stanley Pool
Leopoldville
Kwango R.
Kasai R.
Lulua R.
Sankuru R.
Lomami R.
Aruwimi R.
Ituri R.
Semliki R.
Albert L.
Albertville
Kasongo
Kikassi
Mai Munene
Lukuga R.
Lukenie R.
Kwilu R.
Kwa R.
Ubangi R.
Bangala
Banzyville
Lake Leopold II
Lake Mantumba
Lake Tumba
Lake Ntomba
Lake Mai Ndombe
Lake Leopold II
Lake Kivu
Lake Albert
Lake Victoria
Lake Kioga
Lake Rudolf
Lake Stefanie
Lake Tanganyika
Lake Nyassa
Lake Bangweolo
Lake Mweru
Lake Kisale
Lake Dilolo
Lake Ngami
Lake Chad
Lake Tsana
Lake Rudolf
Lake Stefanie
Lake Nyassa
Lake Bangweolo
Lake Mweru
Lake Kisale
Lake Dilolo
Lake Ngami
Lake Chad
Lake Tsana
Longitude West from Greenwich
Longitude East from Greenwich
20°
0°
20°
40°
60°

NATIVES OF AFRICA—PLATE I

1 Shilluk 2 Dinka 3 Woman of Porto Novo 4 Fulah Girl 5 Tamberma Man 6 Man of Bamum
7 Ama-ngqika 8 Wa-shagga Girl 9 Loango Girl 10 Girl of Kamerun 11 Pygmy
12 Woman of Lunda

NATIVES OF AFRICA—PLATE II

1 Hadendoa 2 Bedouin 3 Biskra Girl 4 Midgan 5 Somal Woman 6 Wahuma Girl
7 Bushman Woman 8 Hottentot 9 Mukamba 10 Hova Girl 11 Sakalava Girl
12 Masai Youth

much as 7,000 feet, perhaps more. South of the Benue the country is very mountainous, with altitudes of as much as 8,000 feet. Advancing from the Benue towards the Gulf of Guinea, we meet with peaks mostly of volcanic origin of 9,000 and 10,000 feet, culminating in the great volcanic mountain of the Cameroons, which is about 13,000 feet and is occasionally capped with snow. A few miles away to the west of the Cameroons lies the 10,000 feet high valcano of Fernando Po Island. From the Cameroons southwards there is an almost unbroken range of mountains at no great distance from the coast, which, except for the passage of a few great rivers, is continuous with Table Mountain at the Cape of Good Hope. The greater part of the center of Africa from the southern Sahara Desert to the southernmost limits of the Congo, is at an average altitude of 1,500 feet above sea level (with depressed areas and ancient lake-basins here and there). On the east this comparative flatness gives place somewhat abruptly to plateaus of 6,000 to 8,000 feet in height, above which towers the snow range of Ruwenzori (the true Mountains of the Moon), nearly under the Equator.

### RAINFALL, FORESTS AND ANIMAL LIFE

West Africa has a much greater rainfall than the eastern half of the continent. There is, however, a somewhat well-marked rainy equatorial belt, which extends from the Victoria Nyanza on the east to the Gambia River on the west, and expands over a good deal of the basin of the Congo, the lower and the upper Niger. This equatorial belt has some of the most splendid tropical forests the world can show. It is in this region also, expecially in Central Africa, that some of the most rare and remarkable of African mammals continue to exist, such as the great Anthropoid Apes (Gorilla and Chimpanzi), the strange Drill and Mandrill Baboons, the Okapi, the Chevrotain, and (in Liberia) the Pygmy Hippopotamus and Zebra Antelope. The Lion has become extinct in North Africa within the last few years, but a Leopard of very large size still exists there, together with a Striped Hyena and the Common Jackal, the true Wild Boar, the Porcupine, and a Red Deer allied to that of Southern Europe. The Sahara Desert is by no means devoid of animal life. A few Lemurs ("half apes") are still found in Tropical Africa and in Tropical Asia, but in Madagascar this group in the recent past developed extraordinarily. Within the human period there existed in Madagascar lemurs nearly as large as a man. Such remarkable forms are extinct now, as is also the gigantic bird of Madagascar, the Aepyornis, possibly the largest bird that this world has ever known, and the origin of the legend of the Rukh of the Arabian Nights. One of the most useful birds in Africa of the twentieth century is the Ostrich, which fortunately has been domesticated and brought into the service of man.

### GOLD, DIAMONDS AND OTHER PRODUCTS

It was not, until 1884 that the wealth in gold of the Transvaal rocks was fully realized, and the gold industry centered in Barberton and Johannesburg was started on a large scale. Since then, the gold export of South Africa has risen to something like £36,000,000 (180,000,000 dollars) per annum. In the sixties of the last century, likewise, the existence of diamonds was made known in South Africa, and the working of diamonds brought immense wealth to that region and quite changed the history of the southern third of Africa. Within the last few years, however, diamonds have been discovered also in German Southwest Africa, in the south-western portion of the Congo basin, and in Liberia, on the west coast of Africa. Gold has also been discovered and worked in the north-eastern basin of the Congo and in Liberia. It has also been worked intermittently for several centuries in Bambara, in the basins of the upper Sengal and upper Niger. Another great source of wealth peculiar to Africa is the oil palm, the full importance of which is scarcely yet realized. The two distinct oils which come, the one from the kerniel and the other from the husk of the nut, are not only of great value as food products for both man and beast, but they furnish the best material for soap, and for a great many other industrial products, including lubricating oils for machinery, and a vegetable fat for making butter. Other products of great future value in Africa will be timber and rubber from the forests and the plantations, the banana (which though not in its cultivated form native to the continent, has been established there for untold centuries), and maize, which, though introduced from America, has found a second home in Africa. Besides the ostrich also, Africa in many parts is a splendid field for horse and cattle breeding. The horses of North Africa are in great demand. So also are certain breeds of sheep and goat. Madagascar is celebrated for its cattle and apparently is free from the pest of the tsetse fly.

### THE HUMAN POPULATION OF AFRICA

The total population of Africa at the present day is probably something like 151,000,000, and apportioned racially would consist of 120,000,000 Negroes and Negroids, 6,000,000 pure-blooded Europeans (absolute White men of Northern or Mediterranean stock), and 25,000,000 of handsome, physically well developed, but mentally rather backward, dark-skinned Caucasians—Berbers, Arabs, Egyptians, Galas, and Abyssinians. Quite distinct, from the true Negro is the Bushman of South Africa, a somewhat (but not always) stunted race, with a yellow skin, very sparse and tightly curled hair, and other peculiar physical features not ordinarily met with in the Negro, though sometimes occurring in the people of the Mediterranean basin. The Hottentot is nothing but an early hybrid between the true Negro and the Bushman.

### POLITICAL DIVISIONS OF AFRICA

Scarcely any portion of Africa at the present day can be described as independent of European rule. The Empire of Abyssinia maintains a tottering independence which cannot last much longer, owing to the utter inability of the ruling race, the Abyssinians, to impose law and order throughout their ill-governed dominions. The little Republic of Liberia on the west coast of Africa was founded by white Americans as a refuge for American slaves who had gained their freedom a hundred years ago. It has not so far been much of a success as a governing power over the wild negroes of the territory proclaimed as "Liberian," and the government of the country is a good deal controlled and influenced nowadays by the American organizers lent by the United States. Not only is the whole of Africa controlled by Europe, but by *Christian* Europe; Muhammadan Turkey being excluded from any further interference in African affairs, since the Italian annexation of the Tripolitaine and the establishment of a British control in Egypt.

### MARVELOUS OPENING UP IN RECENT YEARS

In the truly marvelous opening-up of Africa which has been taking place during the last twenty years, and more especially since the commencement of the present century, the great schemes and public works which most deserve mention in a brief record (beginning on the north and proceeding southwards) are the following:

The damming of the Nile at Assuan, at what is called the first (though it is really the last) of its cataracts. This operation, though it is leading to the submergence of the temples of Philae, will more than double its native population. For Egypt (compared to the rest of Africa) is a healthy land for Black, White, and Yellow. Give it a sufficient water supply in the way of irrigation and it will become one of the wealthiest regions, for its area, on the world's surface and one of the most habitable. What the ultimate consequences of this regeneration of Egypt under the British aegis will be, it is interesting to speculate. Certainly the prosperity of this land will far exceed the greatest altitude ever reached in population and civilization at the best period of the rule of the dynastic Egyptians—let us say, Egypt 1,500 years before the time of Christ; and if ever Egypt again is one of the great nations of the world the thanks of her people will be due entirely to the British nation which undertook its regeneration.

The Italians are commencing a similar work in the Tripolitaine, and once Italy has got effective control we may look with confidence to the restoration of the sparsely inhabited region between Egypt and Tunis to a state of prosperity such as it has not enjoyed since it ceased to form part of the Roman Empire. Wells will be dug and will tap the immense reserves of water underlying the surface of the Sahara. The French have really transformed Tunis from a semi-desert country to one of the most fertile and beautiful in the Mediterranean Basin. Algeria has more than twice the native population at the present day which it possessed at the time the French abolished the rule of the Turkish pirates in 1830–40.

### A VAST SYTSEM OF RAILWAYS

The French are entirely revolutionizing conditions of life in Morocco, chiefly by means of railways. They have carried their eventual Trans-Saharan Railway from Oran on the coast to a distance of 700 miles south, into the desert, beyond the range of the great Atlas. In fact, what with the work of the Italians in Tripoli, the British in Egypt, and the French in the rest of North Africa, there will, before very long, be a continuous line of rail between Tangier through North Africa to Alexandria and Cairo.

The French also, once they are free from any reasonable dread of German invasion, will complete their Trans-Saharan Railway right across the Desert of Timbuktu, and joining with other railways already constructed or under construction, will eventually link up Tangier with Kano in Northern Nigeria, as well as the British, French and German colonies on the West African coast.

Tangier, which will certainly be the point of departure for these tremendous overland railway journeys through the once Dark Continent, constitutes at the present time a tiny internationalized state of Morocco, under the joint guardianship of Britain, France and Spain. It is, of course, only a few hours' steam from Gibraltar and the Spanish and Portuguese coasts. It is the Calais of Africa, and perhaps some day may be its most important city.

### RECENT DISCOVERIES OF MINERAL WEALTH

The extraordinary rate at which railway building is now proceeding in Africa is justified commercially by recent discoveries of great mineral wealth. The tin and the coal of Nigeria; the phosphate deposits of Tunis; mineral oil in Somaliland, Egypt, and the Northern Sudan; gold, tin, copper, coal, petroleum, in North and Central Africa; haematite iron, lead, silver, in Morocco; phosphates, soda, copper, iron and gold in the Sahara Desert and the Egyptian Sudan; are, or will be, inducements for railway adventure in those regions, while in much of Central Africa, Angola, Nyasaland, Uganda, Kamerun, the Congo Basin and the forest regions of West Africa, the inducement for railway and road construction is often not mineral but vegetable; for these regions are producing ever-increasing quantities of rubber, coffee, cotton, tobacco, maize, peanuts, bananas, cocoa, palm-oil and palm-nuts; besides timber, cattle, hides and wax. One of the most interesting phases in the opening-up of Africa is the greatly increased application of the negro races to agriculture and horticulture on their own account. The cocoa of British West Africa is produced not by hired laborers or slaves for white planters, but by free natives working

## AFRICAN ANIMALS

BY PERMISSION F. E. COMPTON & CO.

1—Gorilla. 2—Chimpanzee. 3—Mandril. 4—Giraffe. 5—Koodoo Antelope. 6—Lion. 7—Hippopotamus. 8—Elephant. 9—Warthog
10—Aye-aye. 11—Ringtail Lemur. 12—Banana Bird. 13—Jacko Parrot. 14—Guinea Fowl. 15—Ostrich.
16—Shorthead. 17—Chameleon. 18—Rock Rabbit

their own land. This is the case with regard to the immense ground-nut industry of French West Africa and the palm-oil and rubber of Southern Nigeria.

SIR HARRY HAMILTON JOHNSTON.

**Afrikander** (*ăf-rē-kăn'der*), a name applied to whites of Dutch descent born in South Africa. The term is opposed to *Uitlander*, which signifies an outsider, or one born in another country. The Afrikander Bund is an organization among the Dutch in Cape Colony which aims at the political independence of South Africa in Dutch interests.

**Agamem'non,** the leader of the Greeks in the Trojan war. He was the son or grandson of Atreus, king of Mycenæ, and the most powerful prince in Greece. He and his brother Menelaus married the two daughters of the king of Sparta, Clytemnestra and Helen. When the Trojan Paris carried off Helen, Agamemnon was chosen chief of the forces sent out for her recovery. At Troy, in the ninth year of the war, he quarreled with Achilles over two captive maidens, and almost ruined the Greek cause. After his return from the capture of Troy, he was murdered at a feast by his wife and her lover. His death was afterward avenged by his son Orestes. Agamemnon was worshiped in Sparta as a god.

**Agar'icus.** The best known genus of mushrooms, one of whose species, *A. campestris*, is the common cultivated mushroom. The genus belongs to the *Basidiomycetes*, and the spores are exposed along the surfaces of radiating plates or "gills" under the cap or "pileus." See BASIDIOMYCETES.

**Agasias** (*ă-gā'sĕ-as*), a Greek sculptor of Ephesus, who probably lived about the fourth century. His celebrated work, called the *Borghese Gladiator*, was found in the ruins of Antium in the third century, and is now in the Louvre collection at Paris.

**Agassiz** (*ăg'a-sē*), **Louis Jean Rodolphe,** a distinguished naturalist, was born at Motiers, Switzerland, May 28, 1807. After years of study he began to write on scientific subjects. His reputation was made by his book, *Studies of Glaciers*. In 1846 he became professor of zoology and geology at Harvard College. He made explorations in Brazil and in the South Atlantic and Pacific oceans. Agassiz was not merely a learned naturalist, but a great force. He did much by public lectures and by teaching to make natural history popular. He trained many young naturalists who have carried out his methods. He founded the Agassiz Museum of Comparative Zoology at Harvard College. His *Methods of Study in Natural History* and *Contributions to the Natural History of the United States* are his most popular works. He died at Cambridge. Mass., Dec. 14, 1873.

His son, Alexander (1835-1910), also a distinguished naturalist and writer, was from 1874 to 1897 chief curator of the Museum of comparative zoology at Cambridge, Mass.

**Ag'ate** is a kind of chalcedony. Its colors are arranged in bands, but sometimes form spots, clouds and often stains like moss, when it is called the moss agate. By boiling the stone in a syrup and then in an acid the beautiful colors can be made brighter. Agates take a high polish and are cut into brooches, seals and bracelets, and used in mosaic work. They are found in Egypt, Germany, Scotland, South America, the United States and other parts of the world. In this country moss agates abound in Wyoming, Nevada and other points; small banded agates of great beauty are numerous on the shores of Lake Superior, and also in western Texas, where large specimens are plentiful. The agate marble is a name known to every boy, though most of these marbles are cheap glass imitations. Agate was prized by the ancients, mention being frequently made in history of onyx, the black and white banded agate, and of sardonyx, the red and white.

AGAVE

**Agave** (*ā-gā'vē*). A genus of plants of the amaryllis family, whose numerous species are peculiar to the warm and dry regions of America. Along with forms of cactus and yucca, agave forms the characteristic American desert vegetation. One of the species, the American aloe, has received the fanciful name of Century Plant, from the mistaken notion that it must be a hundred years old before it blooms.

It is a native of Mexico and Central America. In native soils the plant usually blooms in its seventh or eighth year, but in hothouses it rarely blooms until it is from 40 to 60 years old; whence arises the story that they flower

only once in a hundred years. After flowering the plant dies down to the ground and new plants spring up from the roots. It has no stem proper, or a very short one, bearing a crowded head of large fleshy leaves, which are spiny at the edge. From the midst of these shoots up the straight, upright scape, 24 to 36 feet high, and at the base frequently a foot through, along which are lance-like flower branches, ending in clusters of blossoms often numbering 4,000 flowers.

Although agaves are decorative plants in the United States and Europe, in their native home in Mexico they are among the most useful plants. There they are called maguey, and are a regular farm crop and valued highly. Some of the species supply fiber which is used in making rope, cordage, matting, clothing, thread, hammocks, bagging, burlap and other coarse textile stuffs, and the old Mexicans used it to make a coarse paper. Its introduction on our arid western plains is highly recommended, for it will grow in the dry lands of Texas, New Mexico, Arizona and southern California. When pasturage is scarce the leaves are cut up and fed to cattle. From some of the species soap is made, while the two most common Mexican drinks, pulque and mescal, are obtained from still others. When the young flower-bud is cut out, the sap keeps on flowing into the cavity. This juice is quite sweet. It is gathered daily and fermented, and becomes the great Mexican drink known as pulque. It is milky, sour and bad smelling, looking like thin buttermilk, and has a rank taste; yet even Americans soon find it agreeable and refreshing. A distilled liquor is also made from it. The unfermented maguey, called honey-water, is used as a substitute for milk.

**Agesander** (*ăg-e-săn'der*) **of Rhodes,** See LAOCOÖN.

**Agesilaus** (*ă-ges'ĭ-lā'ŭs*), one of the most warlike of the kings of Sparta. Though not the lawful heir, he became king in 398 B. C., and reigned 38 years. He was small, lame and mean-looking, but had a wonderful amount of energy. His first war against the Persians, whom he defeated in Asia Minor, led to his forming the project of entering the heart of the Persian Empire, which Alexander the Great afterward carried out. But he had to give up the attempt in order to defend Sparta against her enemies at home. In the later years of his life Sparta lost her power, but he remained faithful, and devoted his fortune to her service. He died at the age of eighty on the coast of Africa, while returning from a last effort against his enemy, Persia.

**Agincourt** (*a-zhăn-kōōr'*), a village in the north of France, known in history as the scene of the battle between the English under Henry V and the French under the Duke D'Albert, commanding for the Dauphin Charles, Oct. 25, 1415. Having driven the French cavalry by strategy into a swamp, Henry V turned his archers upon them and almost annihilated them. The fugitives threw the army into confusion, and the battle of three or four hours ended in a terrible defeat for the French. More than 10,000 French were killed, including many princes and nobles, while the English lost only 600. This decisive battle so crippled the power of France that Henry V soon had control of the entire kingdom.

**Agra** (*ä'grä*), a city on the Jumna River, in the British Northwestern provinces of India. It contains the Taj Mahal, or Pearl Mosque Mausoleum, the finest piece of Indian Mohammedan architecture in the East. Population 185,449.

**Agric'ola** (born 37, died 93 A. D.), a Roman general, born in the south of France. He was made governor of Aquitania by the Emperor Vespasian, then elected consul, and later given the province of Britain to govern. He spent seven years there, completing the conquest of the island. He built a chain of forts as a defense against the northern tribes, and was the first Roman to send his fleet around Britain, proving it to be an island. He introduced Roman customs and the Roman language. He was recalled by the Emperor Domitian, who was jealous of his popularity. His life has been written by his son-in-law, the historian Tacitus.

**Ag'riculture** comprehends the tillage of the soil, the cultivation and harvesting of crops, the rearing, breeding, feeding and management of the various domesticated animals, and the manufacture of numerous products of the farm into commodities suitable for home use or for commercial purposes. No other of the arts antedates this, which not only feeds and clothes the world but contributes in ways innumerable to its wealth and welfare.

*History.* Wherever husbandry has been in highest esteem there has been found a people advanced in civilization. Apart from the present-day advantages of knowledge that centuries of research and investigation have given, and those contributed by agricultural chemistry, new and improved machinery and modern transportation facilities, the husbandmen of some of the nations of antiquity were in many essentials so advanced as to make comparison of their practices with those of to-day appear by no means discreditable. The ancient Egyptians, we are informed, knew the wisdom of crop rotation, were skilled in their methods of suiting these to soils and seasons, and even the rearing of poultry hatched by artificial incubation was not uncommon. The exceeding care in their execution of deeds of conveyance, minute description of both the seller and realty and explicitness of terms warrant the belief that land was held in earliest times at high value as a means of producing wealth. Farming operations were

overseen by superintendents, shelter provided for beasts and vehicles, and records kept of accounts. The Scriptures abound in allusions to flocks and herds and the produce of the field.

Palestine afforded an early example of intensive farming, where small holdings were the rule. The limited farms, it is recorded, produced abundantly, and their fertility was maintained by judicious cultivation and management. A mixed husbandry obtained, and the fields were enriched by the application of manures. Ancient Romans were among the foremost of their time in agricultural pursuits, and problems of irrigation, tillage and fertilization were among those which commanded their attention. Cato, Pliny and others expounded doctrines that in the present century are being promulgated by our most learned teachers. They recommend rotation, such, for instance, as having wheat follow legumes, because, as Pliny said, they enriched the ground; also the keeping and feeding of live stock was advocated. To-day it is quite generally recognized that any rational system of farming includes these usages.

During the Middle Ages agriculture in Europe under barbarian conquerors was neglected, and those engaged in it held in contempt; its peaceful pursuits were largely abandoned by the landowners for war and the chase, and every one not of the nobility was regarded as a slave, subject to the will of a master. This resulted in a most deplorable condition of labor, and retarded progress; but the end of the feudal system marked the beginning of a new era, and renewed attention was given to tillage. By the end of the seventeenth century it was probably as skilfully practiced as ever before, and the prestige of the husbandmen had been regained.

The eighteenth century was one notable in its relation to the world's agriculture. Jethro Tull, an Englishman, introduced the method advocated by him of sowing crops in drill rows, which admitted of their cultivation, and a four-crop rotation that has been followed more or less strictly to the present time is credited to Lord Townshend. Robert Bakewell, another Englishman, revealed the methods by which all breeds of farm live stock have since been improved, i. e., by judicious selection, mating and feeding, as illustrated in the Leicester sheep which he developed, and in the cattle known as Longhorns which he improved. By the same methods the brothers Colling produced from the native Teeswater cattle the famous breed now known as the Shorthorn, and Herefords were similarly improved or developed by Benjamin Tomkins. These were the pioneers in this work. Thomas Bates, Thomas Booth and others became famous as improvers of Shorthorns, as did Amos Cruickshank, a Scotchman, later, and through the latter's breeding came some of the greatest Shorthorns of the last quarter of a century.

In the light of present-day knowledge and practices agriculture differs much in our own from that of earlier times. Chemistry, invention of new tools and machinery and improvement of the old, better methods of tillage, and superior educational facilities raising the general plane of intelligence are among the more potent forces that have effected the change. The most far-reaching developments have been accomplished durduring the past century, and from the multitude of scientists and investigators now delving into the mysteries of the soil and of animal and plant life, much more of value is likely to be evolved. Agricultural implements and machinery were developed and perfected to their present efficiency only in recent times, and there is nothing to suggest that the end in their improvement is near; the rapid extension of railroads and improved methods of travel and transportation are the work of the past few years, and the institutions on every hand for agricultural education are also the products of modern times.

*Agriculture in the United States.* In the United States there has been no lack of appreciation of agriculture. The chief executives from Washington to Roosevelt have been strong advocates of its promotion. In his first annual message to Congress, in 1790, Washington urged its advancement by all proper means. Many of his later messages and writings contained discussions of the country's agriculture, which he considered of primary importance with reference either to the individual or national welfare. In his last message to Congress he said: "In proportion as nations advance in population and other circumstances of maturity this truth becomes more apparent, and renders the cultivation of the soil more and more an object of public patronage." President Roosevelt in his message to Congress, December 4, 1906, urged the wisdom of scientific research and education as a means of forwarding the country's agriculture, recognized as the nation's chief industry. He wrote: "It is a mere truism to say that no growth of cities, no wealth, no industrial development can atone for any falling off in the character and standing of the farming population. . . . . There is no longer any failure to realize that farming, at least in certain branches, must become a technical and scientific profession."

The pioneer American farmers derived their methods from those in vogue in the respective countries from which they came, and these practiced ever so perseveringly oftentimes failed because lacking adaptability to the new conditions of soils and climate. Besides the natural wildness of the country to be tamed and subdued, the

vicissitudes of their environment were many and hazardous. Wild beasts, unfriendly Indians and the absence of adequate facilities all retarded the country's development. For approximately two centuries farming in America was confined to a comparatively narrow area adjacent to the Atlantic. The first of the farmer's implements were of the crudest, and his practices were wasteful. The conserving of the land's fertility was ignored; such vast areas, uncultivated and unclaimed; encouraged no other practice; and if a field was exhausted it was abandoned and another cleared and tilled. Buildings, equipment and other necessities were had at the expense of the soil. Thus an indifference to the maintaining of the soil's fertility was inherited by succeeding generations, with the result that one of the great problems of our times in the older portions of America is to remedy the evil done in days gone by and inaugurate a system that tends in the other direction. Agricultural chemistry is quite clearly pointing the way. It required a full century for Americans to realize that the productivity of their land was limited, and that the deep fertile soil could become exhausted.

In the aggregate of its field productions the United States is without a close competitor among the nations, but it must be confessed that from the viewpoint of the acre-yield we do not favorably compare with others whose density of population makes small holdings and intensive cultivation a necessity. That our average yields are low may be accounted for by the fact of abundant land in proportion to population. The capabilities of some portions are yet but partially comprehended and of others well-nigh unknown. Owing to the country's vast area the developments already achieved are comparatively superficial because of the largeness of the farms and lack of sufficient labor. These conditions scarcely make possible the use of methods adapted to producing the maximum per acre, although the use of modern machinery has made farming on an extensive scale exceedingly profitable. As the country more nearly approaches a maximum development, with the inevitable increase in population, smaller farms and benefits of the revelations and teachings of science, it may be expected that average yields per acre will show continual increases until the maximum has been attained. Recent economic revolutions in the art and science of agriculture have had a noticeable effect already, as evidenced in the nation's enlarged prosperity.

At the close of the eighteenth century the great percentage of our population were farmers. The farms were comparatively small in area, and tilled sparingly and mostly for self-support; because of lack of adequate transportation facilities markets were not available, and hence there could be little incentive to produce more than was required for home consumption. Inefficient equipment was also a barrier to any surplus that might have been desired. Under these conditions none but the simplest methods were employed, and but scant attention given to cultivation. Providence was the main reliance. In those days it was commonly said that "anybody can farm," and in truth nearly everybody did. With a population the greater part of whom raised their own supplies, and the exporting of any surplus being practically impossible, the situation of the American farmer about the close of the eighteenth century was one that created little enthusiasm. About this time, however, the discoveries of science led to the belief that chemistry would greatly promote the art of agriculture; new ideas were entertained, better implements sought, improved methods were adopted, and a general awakening marked the first great stride in a progress that has become the admiration of the world.

As the population increased and the frontier was gradually pushed further into the interior of the continent the pioneers in the westward movement were required to adapt themselves to yet other conditions and solve new problems. Each new outpost of civilization was in a sense an agricultural experiment station. The vast expanse of country presented a variety of soils and climates, and to learn what crops and methods were best adapted to their differing conditions was tedious and expensive. This gave birth to the state agricultural experiment stations, and with their help many obstacles have been overcome and the development of the country steadily expanded.

The first society for the promotion of agriculture in the United States was organized in 1785; this was followed by others in rapid succession, and at the present time nearly every community has its agricultural association. Agricultural fairs have been helpful educators, and nearly if not all the states have their boards of agriculture or other similar organizations supported with public funds for the purpose of advancing the farming interests. From these are issued reports, bulletins and other useful publications, which are usually distributed free. An extensive agricultural literature has grown up, including not only many general and special works but a long list of periodicals, some of them devoted exclusively to special products of the farm, some particular breed of live stock, or branch of industry such as dairying, poultry raising, market gardening, fruit-growing, bee-keeping and the like.

*Agricultural Colleges.* The educational movement inaugurated by the early agricultural societies has grown into the excellent agricultural colleges, with which are generally connected the experiment stations, in every state and territory. These are given

liberal appropriations by national and state governments, and are assisted and co-operated with by the United States Department of Agriculture. This Department was established in 1862 as a Bureau, under direction of a commissioner. In 1889 Congress enacted a law making it an executive department of the government, under direction of a secretary to be appointed by the president and to be a member of his cabinet. In 1862 Congress also passed the Land-Grant Act, donating public lands to the states and territories providing colleges for the benefit of agriculture and the mechanic arts, which has resulted in the establishment of such institutions in every state and territory. The Hatch Act of 1887 gave $15,000 a year for the maintenance of each agricultural experiment station, for experimentation, investigation and the reporting of results. The value of these stations as agencies for the advancement of agriculture through scientific research was early demonstrated, and in 1906 Congress passed the Adams Act, which has for its object the extension and strengthening of the experimental work of the stations by additional appropriations. By provision of this act the initial appropriation of $5,000 is to be increased each year until 1911, when it will amount to $15,000, making then and thereafter annually available an aggregate of $30,000 of government funds for each station, under the Hatch and Adams Acts.

*Labor-Saving Implements — Transportation.* It is a far cry from the old-time forked stick for stirring the ground to the modern steam plow that turns sixteen or more furrows at a time, or from the flail to the twentieth-century thrashing machine, but these improved implements have been brought to their present perfection in comparatively recent times, and to Americans belongs the distinction of first providing farm implements of the greatest labor-saving and time-saving qualities. The invention of those adapted to the requirements of the American farmers has been a potent factor in developing the country's agriculture. Eli Whitney's cotton gin was the first of these wonderful contributions; Charles Newbold and Jethro Wood were probably the first to fashion the plow of modern times; and Cyrus H. McCormick made the first successful reaper. Until better means of transportation were provided by railways there were comparatively few settlements away from the seaboard or the navigable rivers. Transcontinental railways, by making markets available, have brought remote areas within the pale of profitable agriculture, incidentally quickening a widespread interest in the improvement of country roads, and modern machinery has in large measure solved the next problem caused by the sparse population in proportion to area—that of labor. The acreage of arable land yet uncultivated is vast, the greater proportion, of course, being in the states west of the Mississippi River; much of that previously regarded as barren is being brought into a high state of productivity by systems of irrigation, and much is being accomplished in this line also through a better understanding of climate and soils, the adoption of methods of tillage best adapted to them, and the introduction of plants found more suitable. It is claimed by engineers that under the operation of the National Irrigation Act of 1902, 100,000,000 of acres of practically arid lands now useless may be reclaimed for agricultural and home-making purposes.

*Crop Distribution and Development.* Climate and soil determine the kind of crops raised; for instance, the farmers of some portions of the southern states found theirs especially adapted to cotton and tobacco; others found theirs peculiarly suited to corn, and especially was this the case in the Mississippi Valley states; the great wheat-growing region is further north in the middle states, and semi-tropical fruits are grown throughout the south.

Something of the country's rapid development may be gathered from the fact that the yield of corn in 1910 in the United States was more than twice as much as was produced in 1875. In 1874 the country assumed first rank as a wheat-producer, surpassing France in an aggregate yield of 308,102,700 bushels. In 1901 the yield was 119 million bushels more than double that quantity.

In quantity and value our agricultural productions exceed those of any other class. Sixty years ago the United States produced insufficient breadstuffs to supply home demands, but now is the largest exporter of breadstuffs and other kindred products. American agriculture rivals that of all Europe in the aggregate of its yields, and with a continued growth in population, the consequent decreased areas in individual farms and their better cultivation, a far greater production seems inevitable.

*Exports.* Millions of acres of fresh land have come into production faster than domestic consumption required; this necessitated finding markets elsewhere for their surplus products, and much of America's prosperity is due to her export trade. In providing export commodities the farms overshadow all other sources. Not only this, but the farms support the manufactures of the country by supplying the raw material. For the year ending June, 1910, the value of farm products exported reached $933,000,000, the largest by any country. Of this the live-stock products constituted no small proportion. The annual shipments of our cattle and sheep to foreign ports are estimated in the hundreds of thousands, and dressed meats in millions of pounds. The leading export-product is cotton, the quantity exported in 1910 amounting to 3,206,708,226

pounds, worth $450,447,243. The 1910 cotton crop of Texas alone was greater than that of British India, nearly three times that of Egypt and half as much again as the crop of the world outside of the United States, India and Egypt. Cotton and tobacco were among the first export articles grown in America. In 1910 the live animal exports exceeded a value of $17,000,000, while the packing house and dairy products aggregated $130,632,783.

*Crop Acreage and Value.* According to the national census of the year 1900 there were in the United States 838,591,774 acres, or about 1,310,300 square miles, divided into 5,737,372 farms. Of their entire areas perhaps half were under cultivation. In 1910 the wealth-production of the farms of the United States amounted to $8,926,000,000. Among the crops largest in acreage and contributing to this wealth the most important is Indian corn or maize, a product native to America. The crop of 1910 amounted to 3,121,381,000 bushels, grown on approximately 108,500,000 acres. The value of the 1909 corn crop of the United States was $1,652,822,000, and no other crop of the year was worth half so much. Naturally, corn is more used in America for human food than in other countries, but this is little compared with the whole, and by far the most is utilized in the meat-making industry, of which it is the mainstay and buttress. Its commercial uses have been largely increased in late years, however, and it is important in the manufacture of such commodities as alcohol, starch, glucose, cellulose and oils for various uses, and the newer products have resulted in increasing its price.

Corn is grown in every state and territory, but in recent years the six states of Illinois, Iowa, Nebraska, Missouri, Indiana and Kansas have yielded the major portion. In 1906 these states raised nearly 60 per cent of the year's product. Corn contributes more to the nation's wealth than any other of the cereals. Of the world's total production of 3,478,328,000 bushels of corn in 1908, the United States raised 2,668,651,000 bushels.

Wheat comes second among the grain crops, and as a nation the United States ranks first in its production. The crop of 1909 was 737,189,000 bushels from 46,723,000 acres. For the five years ending with 1909 the average annual yield was somewhat over 700,000,000 bushels. Large quantities of wheat and wheat-flour are exported. Oats, rice, sugar-cane, potatoes, rye, barley, buckwheat and many other crops receive more or less attention, the climate and character of the soil in large measure dictating which shall be grown. Timothy, clovers, blue-grass, alfalfa, and the like, often mixed, and the native wild grasses, both for meadows and pastures, claim vast areas, and especially in many of the central and more western states immense tracts of native grasses are utilized for grazing purposes alone. No survey of agriculture in America would be adequate without special mention of alfalfa or lucerne, which, while one of the world's oldest forage plants, is one of the newest to America. Within a decade its values have brought it to attention as one of the richest acquisitions to the farm. Considerably more valuable as a feed, acre for acre, than the justly-prized red clover, it is even superior as a soil renovator and fertilizer. In the Middle West especially it has already made itself a permanent place, and to this more than to any other agency perhaps is due the marvelous growth of the dairy industry there, which is a striking feature of its husbandry, as it is an important one to the whole country. (See ALFALFA.)

*Dairy Industry.* Indeed, a foremost branch of American agriculture is the dairy, and in recent years its progress has been most marked. The Babcock test, a simple but accurate device for ascertaining the per cent of fat in milk, and the separator which extracts the fat from the milk by centrifugal force, have been incalculable aids to dairymen as well as to the progress of the dairy industry. The Babcock test, in connection with the scales, enables the farmer to detect the profitable and unprofitable cows. The separator cannot only separate the butter-fat from the milk as soon as drawn from the cow, but secures more of the butter-fat or cream from the milk than is possible by the old and laborious gravity system of setting milk in pans or other receptacles and skimming by hand. Creameries and cheese factories mark the thriftier agricultural communities, and it is not uncommon for these institutions to draw their supplies from long distances, many railroads supplying special milk trains to insure prompt delivery. The skill and appliances required for the making of high-grade articles are such that the manufacturing of butter and cheese for commercial purposes has become an extensive business, and has raised the quality of the product as well as taken a burden from the formerly overtaxed housewives.

*Silos.*—The storage of green or partly green forage crops, such as corn, the clovers and the sorghums, in silos, which then becomes silage, has overcome many difficulties of the cattle grower, and especially of the dairyman, making available in winter succulent food second only to June pastures. It not only saves in feed and labor, but makes possible the keeping of an increased number of animals on a given area, as by its use pasture can be largely or entirely dispensed with. It promotes an intensive husbandry that makes possible greater returns from the same farm, and helps to simplify the problem of winter feeding. Use of the silo affords ideal conditions both for the preparation and conservation of feed, and its introduction

may be considered one of the important features of modern agriculture.

*Veterinary Science.* Commensurate with and contributory to the advance in animal husbandry has been the progress in veterinary science. Among beneficial economic measures made possible by veterinary schools have been the inspection by government officials of meat animals and meat and dairy products for both home consumption and export, the quarantine against contagious diseases, and extensive investigation of diseases not hitherto understood. The successful treatment of milk fever in cows by simple, harmless processes has become a great boon to dairymen everywhere. The tuberculin test as a means of detecting tuberculosis in cattle has been perhaps the most valuable discovery of recent years. "Texas" or "Spanish" fever is no longer the dreaded disease it formerly was, and immunity is had by inoculation and by immersion in crude petroleum or other dips.

*Stock Feeding.* All breeds of domesticated animals have been greatly improved in the past century, and the methods of feeding and care have kept pace with the advancement in other lines. Much earlier maturity in meat-producing animals is one of the great improvements attained, as by it increased profits are derived, the feeding period is comparatively shortened, and the investment can be turned oftener. It has been fully demonstrated, too, that far greater gains for given quantities of feed are made in the earlier stages of an animal's growth. Early finishing obviously has many advantages over the former practice of fattening meat animals when several years old. Feeding standards for the various farm animals have been computed that show the quantities and combinations of the different feedstuffs for rations containing the proper proportions of essential compounds, such as protein, carbohydrates and fat. Experiments to identify the digestible nutrients of the different feeds and test their effects when used have resulted in practically determining the food requirements of all kinds of farm live stock under normal conditions. Tables of such feeding standards have been conveniently arranged, and the various rations cover such a wide diversity of feedstuffs that they meet all ordinary farm situations and enable the farmer to form the most advantageous combinations, from the viewpoints of both cost and efficiency. Many farmers have regarded Indian corn as an all-sufficient grain, and, probably because of its abundance and ease of production, it has been difficult to persuade them otherwise. While its low cost of production and high feeding value make it the leading meat-making feed on American farms, its value is greatly enhanced by the use with it of other elements in which it is lacking. Corn has an excess of carbonaceous matter in proportion to the protein compounds, and the tables of feeding standards point out, among other things, how and with what it may be most advantageously associated to make the properly balanced ration. The study of animal nutrition has resulted in most valuable developments for the farmer and stock-raiser.

*Stock Breeding.* Wonderful advancement has been made in the breeding of horses, and one of the marvels in horse speed was the performance in 1906 of the harness horse, Dan Patch, when he paced a mile in a minute and fifty-five seconds. The different breeds of swine have been greatly improved, and something of the importance of the swine industry of the United States may be noted from the fact that about two-fifths of the world's hog supply is produced in the United States, and about six-sevenths of this is from the Mississippi Valley, where the corn is most extensively raised. The various breeds of cattle have likewise been greatly improved for their specific uses, as evidenced by the increased milk flow from dairy cows, and in the superior flesh-forming and fattening propensities of the beef breeds. The live-stock industry has increased greatly in importance in the last half century, and the value of the various kinds on hand in the United States January 1, 1910 amounted to $5,138,486,000, divided as follows: Horses, $2,276 363,000; mules $494 095,000· milch cows, $780,308,000; other cattle, $917 453,000; sheep, $233 664,000; and hogs, $436,603,000.

*Agricultural Chemistry and Seed Selection.* Progress in agricultural chemistry is assisting to a constantly widening development in agriculture. It has taught the composition of soils, whereby their adaptability to certain crops is shown; of the composition of plants, thus determining their relative values in compounding food rations of greatest excellence at minimum cost. It has also tended to the development of new crops, and improved in various ways those already staple. Great strides have been made in beneficially changing the chemical properties of plants, especially in recent years. Plants, like animals, can be modified and improved by selection and breeding, and this is a work now employing the minds of many of our foremost agricultural authorities. For example, corn can be improved in its physical characteristics by the selection of seed according to certain standard requirements, and by planting seed tested by chemical analyses the chemical composition of its progeny can be changed at will, as to a high- or low-protein, or oil content, or other constituent, as desired. The significance of this is readily apparent from the facts stated regarding the feeding standards, as a corn richer in protein would be correspondingly more valuable as a feed for growing animals; high-oil corn would be of

special advantage in fattening stock; and an increase in the percentage of carbohydrates would render it more valuable to the manufacturers of starch, glucose, syrup and other articles. By the application of similar principles the gluten content of wheat has been increased, enhancing its value for the manufacture of flour. Strict selection of seed, which is coming to be more or less generally practiced, according to well-known principles, is having a most telling effect upon subsequent productions. In Minnesota, particularly, where the work has been carried on systematically and continuously for a series of years, the staple crops, such as wheat, corn and flax, have been so improved by selection and breeding that they yield much larger crops per acre than formerly. The study of entomology is also contributing its quota of usefulness to the country's agriculture by revealing the habits of various insects, distinguishing the useful from the harmful, and promoting the increase of those desirable and retarding that of others.

Farming in the United States is being reduced to such a science that the likelihood of crop failure is gradually becoming less. Haphazard methods are replaced by scientific practices that accurately lead to probable results foreknown. It is no longer the drudgery it once was, and the environments of the farmer of to-day are vastly changed for the better from those of the preceding generation. In this time trolley cars, telephone lines, rural free mail delivery and improved roads have modified and benefitted his industrial and social conditions. An enlarged prosperity provides for the modern conveniences in his home, and the situation of the more progressive present-day farmer is one of increased comfort and ease.

F. D. COBURN.

**Agricultural Experiment Stations** in America have been modeled after those of Europe. Their aim is to advance agriculture as a science with special reference to local needs. The federal Department of Agriculture, founded by President Cleveland in 1889, includes an Office of Experiment Stations, which controls the funds that are expended on these stations in the United States, and administers the stations in Alaska, Hawaii and Porto Rico. This department issues a monthly journal called the *Experiment Station Record*. To such states and territories as support an agricultural college, the federal government makes annual grants in aid; many of the states also make special grants. The federal office co-operates with the Experiment Stations to make such investigations as Congress may from time to time desire. Joint researches have even been made in co-operation with foreign agricultural stations.

**Agricultural Schools and Colleges.** As so large a part of our population is engaged in agriculture people have gradually come to see that a study of its underlying principles is just as important and necessary as the study of the older branches of science and philosophy. It was not till 1862, however, that the means for placing the desired instruction within reach of the agricultural community at large was realized through the establishment of state agricultural schools. In that year by act of Congress 30,000 acres of land for each congressman were set aside to ensure the permanent endowment of at least one college in each state and territory for the teaching of agriculture and mechanical arts. In 1890 a further grant was made to each state of the maximum annual value of $25,000.

The majority of the state agricultural colleges are connected with a university. The others, with the exception of the Massachusetts Agricultural College, are departments of technical schools.

Conditions of admission vary considerably in different parts of the country. In parts of the south and west pupils from the eighth and ninth grades of the public schools are usually admitted, while some of the universities have a standard of admission about as high as that for students entering upon literary courses.

As to courses of study, in general the agricultural schools connected with universities do more work along the line of scientific research, while in the schools not connected with universities more attention is given to the directly practical work. The universities wish to put the four years' course in agriculture on a par with those in literature and philosophy. The aim is not to produce all-round agricultural experts, but to give students a general working knowledge of the things of fundamental importance to intelligent farmers, with opportunity of becoming a specialist in some one particular line. The courses usually include care of orchards, grafting, pruning, dairying, feeding and judging of stock, properties of soils, etc.

Some colleges have winter courses, lasting three months, especially adjusted to the needs of those students who cannot afford to be away from their home farms during the rest of the year. Such courses have proved so helpful that many students have returned for several successive winters.

Tuition in agricultural colleges is free, but a small fee is usually charged to cover cost of materials used in experiments. In some states allowance is made for work done by pupils towards the payment of their personal expenses of board and lodging, and in some places free lodging is provided by the institution.

The Agricultural Department of Cornell University has given courses by correspondence which have proved to be highly successful. Too much encouragement and

commendation cannot be given to the farmers and farmers' sons who are industrious and intelligent enough to take advantage of these aids toward improving their vocation, thereby raising their own standard of living and increasing their value to the community in which they live. In few occupations will the results achieved be more increased by a knowledge of underlying principles and an intelligent application of them than in farming.

**Aguilar** (*ă-ge-lar'*), **Grace,** a story-writer for girls, of some popularity, was the daughter of a Jewish merchant in London. Her books are numerous, among them: *Home Influence*, *Women of Israel* and *Days of Bruce*.

**Aguinaldo** (*ă-gē-näl'do*), **Emilio,** late leader of the Filipino insurgents, of mixed European and Mestizo or native half-breed descent, was born in 1872 near Cavité, Luzon Island, one of the Philippine group. He was educated by a Jesuit priest, and at Manila he took a course in medicine. In 1896 he was mayor of Cavité, and later became leader in the anti-Spanish revolt. The insurgents becoming discouraged, Aguinaldo and other chief leaders accepted terms offered by Spain, which involved, however, their expatriation to Hong Kong. Here, when the Spanish-American war broke out, Admiral Dewey found him, and agreeing with him that he would once more take up arms against Spain in the Philippines, he, with his comrades, was given passage thither on the dispatch boat *McCulloch*, and landing in Luzon they renewed the insurrection, besieged Manila, and captured some 5,000 Spanish, including the wife and children of the Spanish captain-general. This achievement, added to Aguinaldo's ambition, appears to have incited him and his compatriots to wrest the islands from both Spanish and American rule; for in June, 1898, the insurgents set up a provisional government with Aguinaldo as president, and when peace between the United States and Spain was proclaimed, Aguinaldo refused to recognize the treaty and assumed active hostilities against the United States. After attacking the American lines on February 4–5, 1899, he declared war by proclamation against the United States, and for over two years maintained desultory fighting against its forces in various parts of the Tagal provinces. Aguinaldo and his immediate following were entrapped on March 23, 1901, at Palanan, and Aguinaldo was made a prisoner by General Fred. Funston and brought to Manila. Here the insurgent president took the oath of allegiance to the United States, and issued a manifesto to the Filipinos acknowledging and accepting the sovereignty of the United States.

AGUINALDO

**Aikins, Hon. James C.,** born in Ontario in 1823. Educated at Upper Canada College. Elected to the Legislature for the County of Peel (his native county) in 1854, and remained in the Assembly until 1861. From 1869 to 1873 he was Secretary of State and a member of the Administration of Sir John A. Macdonald, and was a second time Secretary of State in 1878. Resigned in 1882 and was appointed Lieutenant-Governor of Manitoba. At the expiration of his term of office he returned to Toronto and was again appointed to the Senate of Canada.

**Aino** (*ī'nō*) or **Ainu,** an aboriginal Japanese race of Caucasian stock inhabiting Yezo (Hokkaido), the Kuriles, the southern part of Saghalien and other northern islands of Japan. They are in appearance short in stature, stoutly built, and in general rather hairy; their chief occupations are hunting and fishing. Their present number is less than 20,000. In early times they lived in the heart of the Japanese archipelago and exercised considerable influence upon the Japanese, though these treated them as half-barbarians and drove them to their present retreat in the northern sections of the country. Their religion is a primitive nature worship, though of late many of them have become Buddhist, while a few have been made converts to Christianity. An Aino grammar and dictionary has been published by the Rev. John Batchelor, a missionary who translated the New Testament into the native tongue. Of recent years the Ainos have been blending with the Japanese, the latter having parted with their former low opinion of the mental inferiority of the race and their backward civilization. See Batchelor 's *The Ainu of Japan* (London, 1892), Chamberlaine's *Things Japanese* (London, 1899), and Savage Landor's *Alone with the Hairy Ainu* (London, 1893).

**Air** is the atmosphere in which we live. It is invisible, and has neither taste nor smell, but we know that it is all around us, for we take it into our lungs with every breath and it becomes our most important food. It has weight, which we do not feel because of the air and other gases within us that exert an equal outward pressure. Upon every square inch of the earth's surface there rests a weight of about fifteen pounds of air, so that upon the body of a medium-sized man the air presses with a force equal to thirty thousand pounds. Air may be compressed or packed closely into smaller space than it usually fills. Thus, if a tumbler is pushed down, bottom upward, under water, the water will rise up inside the tumbler and press the air into smaller space. But as the tumbler is brought back to the surface the air again

becomes as rare as the surrounding atmosphere, showing that it is elastic. The weight of the atmosphere makes the lower air so much denser than the upper air that one-half of the whole atmosphere is squeezed into a belt around the earth about three and one-half miles in thickness, while the upper half extends more than forty miles. Air is made up of about 78 parts by volume of nitrogen, 21 of oxygen and one of argon, in 100 parts, and with it is always mixed a variable quantity of water-vapor, which amounts to about one per cent by volume on the average. It contains also about $\frac{1}{3000}$ of carbon dioxide and minute quantities of several other gases, including helium, neon, krypton and xenon, which are inactive elements resembling argon. Oxygen is the element that is necessary to animal life, while carbon dioxide is required by plants. On the other hand, animals produce carbon dioxide while plants give off oxygen, so that each supplies the other, and the composition of the air is kept nearly constant. There is air also dissolved in water, and by the same double process fishes and sea-plants keep the air pure. In the cities the air is less pure than in the country, as there are more people to breathe it and fewer plants to supply oxygen. The gases of combustion and decay, which produce much carbon dioxide, also tend to contaminate the air. In a room the breathing of a number of persons will soon make the air unwholesome if the ventilation is not good. The gas, carbon dioxide, which is commonly called carbonic acid, is often called a poison; but it is not poisonous, although the presence of a large quantity of it interferes with breathing, and if enough is present it may cause suffocation. Carbon monoxide, the gas that burns with a pale-blue flame at the top of coal fires and is present in illuminating gas, on the other hand is a deadly poison. If this escapes unburned into the air of a room, the results may be very serious.

**Air Brake.** See Brakes.

**Air Gun,** a weapon for shooting bullets or other projectiles by means of condensed air. The air is forced into a vessel, usually in the stock, by means of a condensing syringe. When the finger touches the trigger, the air reaches into the space behind the bullet and drives it out of the barrel, and when the finger is taken away the vessel is again closed. Thus several shots may be fired, but with less force each time. At its greatest, the force is not equal to an ordinary charge of gunpowder.

**Air Plants.** Those plants which obtain all their food materials from the air. See Epiphytes.

**Air Pump,** an instrument used either to compress air in a closed vessel or to exhaust the air from a closed vesel. When used for the former purpose it is generally known as a "force pump," and when used for the latter purpose it is frequently called a "vacuum pump."

Air pumps, like other pumps, consist essentially of a cylinder fitted with a piston and two valves. The simplest of those which are used for compressing air is, perhaps, the ordinary bicycle pump illustrated in Fig. 1. Here the piston is provided with a more or less flexible leather collar which allows the air to pass down around it as the piston is lifted. But on the down stroke of the piston this leather collar acts as packing and prevents the air from passing up. Hence this one part acts as both piston and valve.

A second valve, $V_2$, at the bottom of the cylinder prevents the air in the tire from getting back into the cylinder during the upstroke of the piston.

The vacuum pump is built upon exactly the same principles as the force pump, only the direction in which the valves open is reversed.

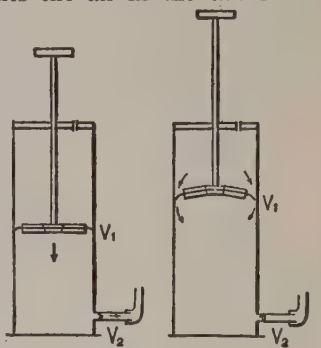


Fig. 1
SINGLE-ACTING BICYCLE PUMP

The first artificial vacuum was produced by Otto von Guericke, about 1650, with a pump similar to an ordinary lift-pump used in wells, except that instead of pumping the air out of an open vessel, such as a well, he pumped it out of a closed vessel.

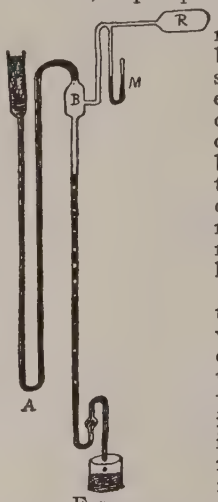


Fig. 2
SPRENGEL AIR PUMP

The immense improvement which has recently been made in the construction of air pumps, especially by the introduction of valves which open automatically, can be seen from the fact that Guericke's pump required four able-bodied men to operate it. A modern air pump is easily worked by one hand.

Ordinary vacua are thus produced by a piston working in a brass cylinder; but when it comes to "high vacua," such as those employed in the incandescent lamp and in X-ray bulbs, a much more perfect instrument is required. Here it is necessary to replace the ordinary cylinder by a mercury column in a glass tube.

In Fig. 2 is given a diagram of the best of these mercury pumps, the one devised by Sprengel.

The supply of mercury is contained in the reservoir on the left. It flows over into the bulb B, where it falls in drops into the long tube on the right. These drops entrap between them the air in B. The mercury which runs out is collected and poured back into the reservoir on the left. In this manner practically all the air can be removed from the bulb B, and hence from any vessel R, which may be connected with B. At M is a manometer which indicates the pressure in the vessel R, which is being exhausted.

A pump of this type is capable of producing a vacuum in which the pressure is only 100,000,000th of an atmosphere.

**Aix-la-Chapelle** (*āks-lă-shă-pel'*), German Aachen, a city of Prussia. It was founded by the Romans and contains the tomb of Charlemagne. Three treaties were signed here, the most important being that of 1748, when a congress was held between France, England, Holland, Austria, Spain, Sardinia and Modena. This treaty made Switzerland independent, the Rhine free to navigation, secured the Protestant succession in England, and the disunion of the French and Spanish crowns. The dislike of England and France for the treaty caused the "Seven Years' War," begining in 1755. Pop. (1910) 156,044.

**A' jax** was the son of Telamon, king of Salamis, and next to Achilles in warlike strength. He led the men of Salamis to Troy in twelve ships, and was called the bulwark of the Greeks. At the death of Achilles Ajax, as the bravest of the Greeks, claimed his armor, but it was given to his rival, Ulysses. Upon this, becoming insane, he killed himself. Sophocles tells the story of his madness and death in his tragedy *Ajax*.

**Ak' bar,** one of the greatest and wisest of the Mogul emperors, was born at Amarkote, in Sindh, in 1542. When he ascended the throne only a small part of what had formerly belonged to the Mogul empire owned his authority, and he devoted himself with wonderful success to the recovery of the revolted provinces. He tried by every means to encourage commerce. He had the land carefully measured, so that the taxes should be fair. His people were of different races and religions, but he was just and tolerant to all. He founded schools and was friendly to scholars. Measures like these gained for him the title of "Guardian of Mankind," and caused him to be held up as a model to Indian princes of later times. He died in 1605.

**Akene** (*ā-kēn'*). A seed-like fruit, as in the sunflower, dandelion, etc. Often written "achene." See FRUIT.

**Akenside** (*ā'ken-sīd*), **Mark** (born 1721, died 1770), an English physician and poet, who chiefly owes his position among the poets to his *Pleasures of the Imagination*, a poem which at once became famous.

**Ak' ron,** Ohio, a city, the county seat of Summit County, and a large manufacturing, shipping and railroad center, 35 miles south of Cleveland. Incorporated in 1836, the city is on the Ohio Canal, the Pennsylvania, Erie, Baltimore & Ohio and other railroads. It has coal mines in its vicinity and large industries within it, including one of the largest printing and publishing establishments in the world, match and rubber goods factories, flour and other cereal mills, boiler and mining machinery works, besides cordage, pottery and sewer-pipe, mower and reaper works, a lithographic plant, etc. The Municipal University, formerly Buchtell College, has its seat here, with 20 instructors and 300 students, while there are good public school facilities, a public library, a hospital and efficient police and fire protection. In the neighborhood, reached by train service, are a number of attractive lake resorts. Population 100,000.

**Alabama** (*al'a-ba'ma*), **State of** (meaning "here we rest"), with its southern border on the Gulf of Mexico, is from 150 to 200 miles wide, and from 278 to 336 miles long, and is larger than New York, Pennsylvania or Virginia.

*Surface.* The area of the state is about 52,250 square miles. The northern end of the state is crossed by the Tennessee River, which in the west flows through a fertile terraced valley, but in the eastern section is flanked by low mountain ranges. The Allegheny range enters in the northeast, trends southwest and terminates in foot hills and sand mountains toward the center of the state. There next succeeds on the west a plateau in which are found the rich iron and coal beds for which the state is famous; on the east a Piedmont region of rolling upland, while the southern part of the state, comprising three-fifths of its area, is a broad coastal plain.

The chief rivers are the Mobile, Alabama, Tombigbee and Tennessee. The Mobile is formed by the junction of the Alabama and the Tombigbee, and after a short course of forty-five miles empties into Mobile bay.

*Climate.* Because of its altitude the northeastern section of the state has a delightful climate; the Piedmont region is healthful, and in the country near the coast the heat is tempered by the Gulf winds, while the low lands along the rivers are malarious.

*Resources.* The climate and varied soils of Alabama are favorable to the growth of a wide range of agricultural products, and previous to the discovery and development of its vast mineral wealth the products of the state were chiefly agricultural. The chief crop is cotton, grown throughout the state, but especially in the famous black

belt which crosses the state. Her annual yield of this great staple gives Alabama the rank of fifth among cotton-producing states. Other important products are corn, oats, sweet potatoes, sugar cane, peanuts, peaches and melons.

In minerals the state is enormously rich. Immense deposits of iron, coal and limestone in close proximity afford conditions for the manuafcture of iron products at low cost, and this has led to great development of this and kindred industries within the last twenty years. In quantity of coal mined the state ranks fifth in the United States, and in iron ore mined it ranks third, next after Michigan and Minnesota. Other minerals include immense beds of cement rock and of phosphates; also soapstone, lithographic stone, emery and corundum, asbestos, graphite, slate, gold, silver, copper, tin and marble of finest grade.

*Manufactures.* The iron industry is the most important and has had marvelous growth. This has facilitated and given impetus to the establishment of other industries, so that the manufactures of the state have doubled in ten years. Manufactures of open-hearth steel and of cotton goods have greatly advanced in recent years.

*Transportation.* The state is traversed by about 5,225 miles of railway. The rivers of the state furnish 1,500 miles of navigable waters, the main streams, the Alabama and the Tombigbee, connecting with the port of Mobile through the Mobile River.

*Education.* Alabama maintains separate schools for white and colored children, and applies the public school fund in exact proportion to the two classes of schools. In the state there are now 6,566 public schools, besides 45 high schools, nine normal schools, three of them for colored students, three private normals, nine agricultural schools, nine universities and colleges and nine women's colleges. Among the more prominent institutions are University of Alabama, at Tuscaloosa; Southern University (M. E.), at Greensboro; St Bernard College (R. C.), at Cullman; at Auburn, the Polytechnic school and the Agricultural and Mechanical College; at Tuskegee, the Tuskegee Normal and Industrial Institute (colored), which has national fame.

*History.* The first settlement was made at Mobile Bay, in 1702, by the Frenchman, Sieur de Bienville, called the "Father of Alabama," though De Soto, the Spanish cavalier, was the first to cross the state with his knights, priests and crossbowmen, in 1540. In 1813 occurred the war against Tecumseh and the Creeks. Alabama was admitted to the Union in 1819. In January, 1861, the state seceded and furnished the confederate army sixty-nine regiments of infantry, twelve of cavalry and twenty-seven batteries. The principal cities are Mobile, Montgomery (the capital), Birmingham, Anniston, Selma and Demopolis. Population 2,348,273.

**Alabama Claim, The.** The *Alabama* was a cruiser which was built in a British port for the use of the Confederacy in destroying the commerce of the northern states during the Civil War. Against the protests of Mr. Charles Francis Adams, the American minister to Great Britain, the *Alabama* was permitted to sail from the latter country in 1862. For three years she did much harm to the shipping of the United States, but she was at last defeated and sunk off the northern shore of France (June 19, 1864) by the *Kearsarge*, under the command of Captain Winslow. The United States presented its claims for damages to Great Britain. In 1871 it was decided by a treaty between the two countries to submit all claims for damages done by the *Alabama* and other vessels to a tribunal of five persons, who were to be named by the President of the United States, the Queen of England, the King of Italy, the President of the Swiss Confederation and the Emperor of Brazil. In 1872 this court awarded $15,500,000 to the United States. Because the tribunal met in Geneva, Switzerland, its verdict is often called the *Geneva Award.*

**Alaba'ma River,** a river of the state of Alabama, is formed by the junction of the rivers Coosa and Tallapoosa. It unites with the Tombigbee to form the Mobile at a point forty-five miles above the Gulf of Mobile. It has a depth of six feet for sixty miles above its mouth.

**Alabaster** (*ăl'a-băs-tĕr*). See GYPSUM.

**Aladdin** (*ă-lăd'in*), a hero of one of the stories of the *Arabian Nights' Entertainments.* He possessed a wonderful lamp and an equally wonderful ring, on rubbing which two frightful genii appeared, who are, respectively, the slave of the ring and of the lamp, and who obey the bidding of any one who may have them in his keeping.

**Alameda** (*ā-lā-mā'da*), California, an important city of Alameda County, opposite San Francisco, on the shore of the Bay of San Francisco, and contiguous to the city of Oakland. It is reached by the Southern Pacific, Central Pacific and Santa Fe railroad systems; while by ferry from the moles and wharfs of the town it is connected with San Francisco. The town makes a delightful suburb of the latter city, surrounded by shady oaks, and with clean streets, good schools and churches and the quiet and freedom of suburban life. Population 30,000.

**Alamo** (*ā'lā-mo*), **The,** a fort near San Antonio, Texas. Here 188 Texans bravely resisted 2,500 Mexicans from February 11 to March 5, 1836, and nearly all perished rather than surrender. When the fort was taken by the Mexicans, who lost 1,600 men, only five Texans were alive. These

were ordered to be shot. Here were killed David Crockett and Col. James Bowie, from whom the bowie knife was named. Because of this heroic defense Alamo is called the "Thermopylæ of America." "Remember the Alamo!" became the cry of the Texans in their struggle for independence.

**Al'aric,** whose name means "all ruler," was a chief and king of the Visigoths. We first find him in 394 A. D., as a commander in the army of the conquered Goths, under the Roman Emperor Theodosius. When Theodosius died, the Goths rebelled, attacked Athens and plundered it of its treasures. A Roman army was now sent against him, under General Stilicho, which drove him to a stronghold in Elis and besieged him there. Managing to escape with his army, the new emperor, Arcadius, decided to make him prefect or governor of the Roman province of Illyricum. This kept Alaric quiet for five years. But about 400 A. D. he set out to invade the empire of the west. It took him two years to reach Milan, where the Emperor Honorius was. He drove him to a fortress and besieged it, but was defeated here, and afterward at Verona, by Stilicho. Still it was thought safest to give Alaric his old place as prefect of Illyricum and a large amount of gold. When the emperor foolishly killed Stilicho, his best general, Alaric marched at once on Rome and laid siege to it. When the people attempted to buy him off, his price was so exorbitant that they said they could not pay it. Alaric's well-known reply was, "The closer hay is pressed, the easier it is mown." He was at last bought off with a great treasure of gold and silver. Honorius, however, broke the treaty, and a second time Alaric attacked Rome. This time the people opened the gates and asked him to name a new emperor. When Honorius became emperor again, he sent, treacherously, a savage chief to attack the camp of the Goths. Alaric marched again on Rome and pillaged it for six days, and then overran all Italy with his troops. He died in 410.

**Alas'ka,** a territory of the United States, situated in the extreme northwestern part of the continent. In a political sense Alaska is not a territory but a district, with no territorial organization. It is governed directly by Congress at Washington, and is locally administered by a governor appointed by the President. It is bounded on the north by the Arctic Ocean; on the east by British Columbia and the northwest (Yukon) territories of Canada; on the south by the Gulf of Alaska and the North Pacific; and on the west by Bering Strait and the North Pacific Ocean. It comprises an area of 590,884 square miles, equal to one-sixth of the United States or one-seventh of Europe. Much of the coast line is very irregular, deeply indented and having many islands, the chief of which are the Aleutian, Prince of Wales, Chichagoff, Kadiak, Baranoff, Admiralty, Unimak, St. Lawrence, Kupreanof and Pribyloff Islands.

*Surface* The coast line is followed by mountain ranges, which are a continuation of the Rocky Mountains, and spread apart in this peninsula. The main range bends westward along the coast to the end of the Alaskan peninsula. The other takes a northwest direction at Prince William Sound, and a second turn gives it a southwest-northeast direction, and it is known as the Alaskan Range. This is the loftiest elevation in North America. Its noted peaks are Mt. McKinley (20,464 feet), Mt. Logan (19,539 feet), Mt. St. Elias (18,024 feet) and Mt. Wrangell (17,500 feet).

Moving down through the valleys of this chain of mountains are the great ice rivers, known as glaciers. Many of these reach to the sea, and one of them, Muir Glacier, not far from Sitka, is wonderfully beautiful.

Alaska's interior, west of the Porcupine Hills, is a vast swampy moor which stretches to interminable wastes of tundra that reach to the Arctic Ocean.

*Climate.* The entire coast section and the insular districts are influenced by the Japanese current and the mountains. The latter are a protection against the Arctic winds, while the former fills the air with warm vapors. Condensation takes place when these come in contact with the mountains and causes almost perpetual fog and rain. For these reasons the temperature is less extreme than in districts east of the Rockies. Inside the mountains, where the warm currents and vapors are absent, Arctic weather prevails—long intense winters and short warm summers.

*Drainage.* The main river is the Yukon, over 2,000 miles long, which may be traveled from end to end four months out of the year without seeing snow. Other rivers are the Stickeen, Copper, Sushitna, Mushagak and the Kuskowim, and the tributaries of the Yukon, which are the Porcupine and the Tanana. The Sushitna is navigable for 110 miles and the Yeutna for 100 miles.

*Minerals.* The all important mineral product so far is gold, of which the product in 1908 was $19,858,800. In 1909 the amount produced was $20,339,000, but in 1910 there was a decrease in gold production, the total shipment being $15,173,008. Coal is found in several places, the best grade in Copper River Valley. The main coast range contains extensive copper deposits, while silver, tin and petroleum have been found, and on Prince of Wales Island large quarries of marble.

*Forests.* The forest wealth of Alaska is also large, chiefly white pine, cedar and

fir. The most valuable timber is the yellow cedar; there is also balsam fir, used for tanning, but the wood of universal use is the Sitka or Alaska spruce, which grows in a stunted form even up to the Arctic circle.

*Agriculture.* Alaska claims only that she can supply her present population with its agricultural needs. Experiments have demonstrated that oats, wheat, rye, barley, potatoes, turnips, beets, lettuce, radishes, etc., have been planted, and nearly all reached perfection in the brief summer. In the Yukon Valley are wild berries of great variety, wild celery, wild parsnip, beautiful ferns, purple lupine and red columbine, yellow lilies on the ponds and iris on the banks.

*Fisheries.* The fisheries of Alaska are among the richest in the world; more than half of the salmon product of the United States comes from Alaska, while cod, mackerel, halibut and herring are found. The Pribyloff Islands are the seat of the fur seal industry of Alaska. The number of seals to be killed each year is fixed by regulation of the secretary of the treasury.

*Education.* Alaska has 35 public schools, and the Protestant and Catholic church organizations have their missions, churches and converts.

*History.* The peninsula and strait were discovered in 1728 by Vitus Bering, a Danish navigator in Russian service. The first settlement was made in 1784 on Kadiak Island at Three Saints, and in 1799–1800 the important one at Sitka. In 1867 the United States bought the territory from Russia for $7,200,000, and took formal possession on October 18th the same year.

*Boundary Dispute.* The United States and Russia claimed joint ownership of Bering Sea as an inland body of water to protect their seal fisheries. This Great Britain would not allow, for she had Canadian sealing interests to protect. At length in 1902 a protective agreement was entered into between the two nations.

Besides, there was an old contention as to the United States and Canadian boundaries which was never urged because the districts in debate were regarded as worthless. The discovery of gold in 1896–97 revived the question and forced a settlement. On September 3, 1903, the Alaskan Boundary Commission met in London, and on October 20, 1903, the official report was signed by the British and American commissioners, the Canadians refusing. The majority ruled, nowever, and the report was substantially in favor of the United States. By the decision the gold fields are part in Canada and part in the United States, but the Pacific coast-line is wholly within the control of the United States.

*Cities.* Juneau, in the southern district, near Douglas Island, is the capital (population 1,644); the other chief towns are Nome City, at Cape Nome on Norton Sound, opposite St. Michael (population 2,600), Sitka, on Baranof Island in Sitka Sound (population 1,039), Skaguay City near the head of the canal (population 872), and the chief mart where the miners purchase their supplies on their way north, by the Chilkoot Pass, overland to the gold mines of the Klondike and the Yukon.

Alaska is provisionally divided into two districts, the northern and the southern, the census of 1910 giving the territory a total population of 64,356.

**Albani, Madame** (Marie Louise C. E. Lajeunesse), a famous soprano and prima donna, was born at Chambly, near Montreal, Canada, November 1, 1850. After an education at Montreal, Paris and Milan she made her début at Messina, in 1870, in Bellini's opera of *La Sonnambula.* In 1878 she married Ernest Gye, the English impresario. In 1897 she was awarded the Beethoven gold medal by the London Philharmonic Society.

**Albania** (*ăl-bā′nĭ-ă*) is the southwestern part of European Turkey. It is about 290 miles long from north to south, and from 40 to 50 miles in width. The country is mountainous, and is noted for its underground rivers and beautiful lakes. The Albanians are mountaineers and many of them brigands.

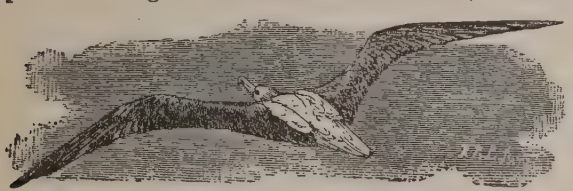
**Albano** (*ăl-bā′no*), a lake, mountain and town in Italy, situated about 15 miles southeast of Rome. The town (known as the Roman Alba′num) is built on the slope of the Alban mountains, on the site of Pompey's villa. It is noted for the beauty of its surrounding scenery and for the interest it possesses for the classicist and antiquarian. Population between 6,000 and 7,000.

**Albany** (*al′ba-nĭ*), the capital of the state of New York, is situated on the west bank of the Hudson River, 142 miles above New York City. It was settled by the Dutch in 1614, and was the first settlement, after Jamestown, within the thirteen colonies. In 1624 a Fort Orange was built, and the village which grew up around it was named Beaverwyck. This was changed in 1646 to Willemstedt. When captured by the British in 1664, the name was changed to Albany. The city was chartered in 1686. It is an important distributing point for trade from the west. It has a large trade in fruit, lumber, grain and wool, and extensive manufactures of iron, stoves, shoes and other products. It has many fine public buildings, of which the most notable is the state capitol, a magnificent structure, built of granite, at a cost of over $24,000,000. It is the seat of the State Normal College, Albany Institute, the medical and law schools of Union College

at Schenectady and other educational institutions. Fine residences and public buildings, a beautiful park, modern filtration plant, and excellent drainage combine to make it an attractive as well as a healthy city. Population 110,000.

**Albany Congress.** A convention of representatives of the colonies of Massachusetts, New Hampshire, Connecticut, Rhode Island, New York, Pennsylvania and Maryland which met at Albany at the call of the British government, June 19, 1754, to consider defensive measures in view of the threatened war with France. At this congress Benjamin Franklin proposed a confederation of the colonies under a president to be appointed by the Crown, with a council to consist of representatives chosen by the different colonies. The president, who was to be commander in chief, was to appoint all military officers, and commission civil officers who should be nominated by the council, and to have veto power over the council. The council was to have power to assess taxes, maintain an army, build defenses and legislate concerning matters of common interest, such as relations to Indians, etc. The plan was not adopted, and the congress was of consequence only as presenting an idea which later on was realized in the union of the colonies.

**Al′batross,** a long-winged ocean bird, occurring in tropical and southern seas. It almost never goes ashore, save in the breeding season, then seeks lonely cliff or rocky slope. The single egg is usually hatched in the bare earth. The albatross is famous in literature, as in Coleridge's *Ancient Mariner*, and also in accounts of voyages. The birds follow vessels for many days, being almost continuously on the wing, though, in calm weather, they are sometimes seen resting on the surface of the water. Many naturalists believe that their powers of flight have been overestimated,



WANDERING ALBATROSS

and that most of the birds sleep on the water at night and join the ship again after an interval of rest. A few birds may be seen flying astern at night, but a less number than in the daytime. They feed on refuse that is thrown overboard, not diving for their food but eating what they find on the surface of the water. Their cry is between that of a raven and a sheep. The wandering albatross or Cape Sheep is the largest water-bird in existence, sometimes measuring 14 feet in expanse of the wings. Its general color is white, with wavy lines of black, and its hand feathers are black. The bill is pinkish white and the legs a light flesh color. The coat of feathers is very heavy, serving as protection against water and long continued cold. Their flight is described as a beautiful sailing motion.

**Albemarle.** See MONK.

**Al′bemarle Sound,** a deep, shallow inlet of the Atlantic, on the northeast coast of North Carolina, connected southward with Pamlico Sound. It extends from the mouth of the Roanoke River for about sixty miles eastward, where it is separated from the Atlantic by a long, narrow spur of land. It is from 5 to 15 miles in width, and being enclosed from the ocean its waters are mainly fresh, while it is almost useless for shipping. Its average depth is only 20 feet. The Sound and neighboring region received its name in early colonial days when Charles II of England, in 1663, made a favorite general of his, the first Duke of Albemarle, one of the Lords Proprietors of the Carolinas.

**Alber′ta** became a province of Canada in 1905. It and the new province of Saskatchewan were carved out of the Northwest Territories. Out of 22 members in the Canadian Parliament it was given a representation of seven members. It lies north of the international boundary line and immediately east of the Rocky Mountains, between the 49th and 60th parallels of latitude and the 110th and 120th meridians. Its area is 255,285 square miles and its population (1911) 374,663. It stretches 760 miles from north to south. The state of Montana lies to the south of it and the province of Saskatchewan to its east. No other political division of the Dominion possesses greater or more varied natural resources. Edmonton is its capital and seat of government; Calgary and Medicine Hat, considerable centers of population, are in Alberta.

*Climate.* It is characterized by a mild climate in winter and cool breezes in summer. Its location gives it the benefit in winter of the Chinook winds, which follow an easterly direction from the currents in the Pacific Ocean, whence they receive their warmth. The snow in winter rarely lies longer than four or five days at a time when it is melted by the wind, thus making the winters mild and filling the creeks and ponds with water for the stock on the ranches. In the summer these creeks are constantly supplied with water from the melting snow in the mountains, so that during summer and winter there is always to be found throughout the district an abundance of water for grazing and all other purposes.

*Resources.*—The wild grasses are most nutritious, as has been demonstrated by the thousands of cattle sold from the different ranches all in first-class condition for the market.

The grain raised in Alberta at present is largely required to supply local requirements. The surplus finds a market in British Columbia, the Orient, and to some extent in eastern Canada. Winter wheat is successfully grown in Alberta, more especially in the southern parts, and the area under crop is rapidly increasing. The growing of winter wheat has revolutionized conditions.

The cool temperature in summer, with the grasses and pure cool mountain streams mentioned, makes Alberta one of the best countries to be found for cheese and butter-making, and it is rapidly becoming as noted for such industries as for its ranches.

There is a local lumber supply at Edmonton and other points, but the finer grades are obtained from British Columbia.

The province is opened up by the Canadian Pacific Railway and its branches from Calgary to Edmonton, Macleod and to the great ranching country around Medicine Hat, which, owing to its climate, permits cattle to graze without shelter throughout the whole winter.

Alberta has a border line of 30 townships which front upon the American Republic. The province contains 170,000,000 acres of arable lands. Of this immense tract scarcely one million acres have been tilled. It has no waste country. In its southwest corner (near Montana) there is a rich oil field. Its coal fields extend all over the province; vast deposits of coal are found all along the foothills. Medicine Hat, one of its largest towns, is famous for its natural-gas wells. The largest zinc smelter in the world is at Frank, Alberta. Its greatest wealth, however, will always be in agriculture. The northern part of this province is in the same degree of latitude as Scotland, and the southern part of the province the same as a part of Germany. North Alberta is watered by portions of two great river systems, the Peace River and the Athabasca River. The markets of the agricultural products of Alberta will, it is likely, ultimately be to the west and to the Orient what they are now to the mining districts of British Columbia. Her coal will go to the east, to the plains of Saskatchewan and the prairies of Manitoba, but her agricultural products will seek a nearer market. It is over 2,000 miles to Montreal, and only 600 to Victoria, B. C. The soil of from one to three feet of black vegetable mould with but little of sand or gravel is of almost inexhaustible fertility.

*Education.* Common schools are established with liberal government assistance wherever the number of children of school age warrants. High schools are established at several central points, and arrangements are well under way for opening a well equipped provincial university. The opportunities for primary (common school) education are excellent, and when the university opens for actual work the facilities for the professional training of the teachers, a most important consideration, will be all that can be desired.

**Albert Edward Nyanza** (*ăl-bĕrt ĕd'wĕrd nī-ăn'za*), a lake in Africa, about 50 miles southwest of Lake Albert and connected with the latter lake by the Semliki River. This lake was discovered by Stanley in 1876, and was again visited by him in 1889 while on his Emin Pasha relief expedition; but it is still somewhat veiled in uncertainty. It is probably much smaller than its northern companion. Several small salt lakes are in its vicinity. Its old name was Muta Nzige. Stanley says of this lake: "No rivers of any great importance feed the Albert Edward Nyanza, though there are several which are from 20 to 50 feet wide and two feet deep. The river-like arms of the lake, now narrowing and now broadening, swarm with egrets, ducks, geese, ibis, heron, storks, pelicans, snipes, kingfishers and other water-birds." ("Nyanza" means "lake".)

**Albert Nyanza,** a large lake in east Central Africa. Its surface is 2,720 feet above the level of the sea. On its western coast are the Blue Mountains, rising 7,000 feet higher, and on the east steep cliffs rise almost as high. The White Nile, flowing from Lake Victoria, enters Lake Albert and issues from it near its northernmost point. Sir Samuel Baker was the first European who explored it in 1864. Area about 2,000 square miles.

**Albert, Prince Consort,** Prince of Saxe-Coburg-Gotha, and husband of the late Queen Victoria of England, was born near Coburg, August 26, 1819. He married Victoria in 1840; soon after was made field-marshal in the British Army; and in 1857 received the title of prince consort. He acquired great influence in public affairs as the prudent and trusted adviser of the queen, and became popular throughout England. He died December 14, 1861.

**Albigenses** (*ăl-bĭ-jĕn'sēz*), a French religious sect, so named from the town of Alby, where a council was held in 1176 which condemned their doctrines. They taught the doctrines of the Manichæans that there are two opposing principles, one good and the other evil. They also rejected the Old Testament. The sect practically died out about 1227.

**Albino** (*ăl-bē'nō*), a person or animal whose skin and hair are perfectly white. The white negroes of West Africa were first called by this name by the Portuguese, but it is now applied to persons of any race who

have this peculiarity, though it is most common among dark races. Animals also have the same peculiarity, as the white elephant, white hare and white mice. The whiteness is caused by the absence of coloring matter in the outside layer of the skin. The eyes of albinoes are red, and are weak in the daytime but strong at night.

**Alboni, Marietta,** a celebrated (contralto) opera singer, born in the Romagna, Italy, in 1823, and died at Paris, June 23, 1894. She studied under Rossini and made her début at Bologna, achieving a phenomenal success. She afterward sang in all the chief Continental and English cities, and also appeared in the United States. She married Count Pepoli, a Bolognese, after whose death, in 1863, she retired from the stage.

**Albu' men,** a substance familiarly known in the white of eggs, which exists abundantly in all animals and in the juices, seeds, grains and other parts of plants. It is one of a class of substances called *proteids*, which form an important part of food, since they build up the tissues of the body. Albumen is naturally a fluid, but when heated to a high temperature it is changed into a firm, white solid. White of egg is used to clear liquids, as coffee, because when boiled it collects all the impurities in flakes and rises to the surface as scum, or sinks to the bottom, according to the weight of the liquid holding it.

**Albuquerque** (*ăl-bōō-kēr'kā*), the county seat of Bernadillo County, New Mexico. It is 56 miles southwest from Santa Fe, and its elevation is 4930 feet. The territorial University of New Mexico is situated in this city. Among the chief industries of the city are the trade in wool and hides and manufactures of lumber, sash, doors, boxes, etc. There are mines of gold, silver, copper and iron in the vicinity. Albuquerque is located on the Atchison, Topeka & Santa Fe railroad. Owing to the surrounding resources and the enterprise of its people its industries are developing and its population increasing at a rapid rate. **Population, 11,020.**

**Alcamenes** (*al-kam'ē-nēz*), a famous Athenian sculptor, a pupil of Phidias. He flourished from about 448 to 400 B. C. He is said to have once competed with his master in chiseling a statue of Minerva. Alcamenes's statue was beautiful in finish, but he had forgotten that it was to be placed on a high column; and so placed his work would not bear comparison with that of his great master. His masterpiece was his statue of *Venus Urania*, in the temple of Venus at Athens.

**Alcestis** (*al-ses'tēs*). In classic mythology, the daughter of Pelias and wife of Admetus, king of Thessaly. She is said to have sacrificed herself that her husband's life, then in danger, might be spared, as Apollo had promised her. She was brought back from Hades by Hercules. The story of her wifely devotion is the theme of a tragedy, or rather of a melodrama, by Euripides.

**Al' chemy,** the art of making gold and silver and of preparing a universal medicine. In ancient times it seems to have been cultivated to some extent by the Greeks and Chinese, and was learned by the Arabs in their invasions. In the middle ages it was looked upon as a science, and was earnestly studied among the nations of Europe. A university of alchemy was founded at Prague, and princes for a time kept their private alchemists.

The alchemists believed in the existence of a certain solid red preparation called the philosopher's stone or the grand elixir, which, when placed on common metals, such as lead, and melted to a liquid, would change them into gold. It would also cure all diseases, while a similar white preparation changed all metals to silver. In the study of this art many scientific truths were discovered, and so alchemy became the forerunner of chemistry.

**Alcibiades** (*ăl-sĭ-bī'ă-dēz*), one of the most brilliant of the Athenians. He was born at Athens about 450 B. C., and boasted that he was descended from the hero Ajax, and through him from Jupiter himself. He was brought up by Pericles, his guardian, and was a favorite pupil of Socrates. He was beautiful in person, had splendid abilities and energies and great ambition, but was without self-restraint and utterly selfish. Entering public life at the time of the contest with Sparta he became the leader of the war party, and persuaded the Athenians to undertake an expedition against Sicily. The night before he set out as one of the generals all the images of the god Hermes or Mercury were thrown down, and he was charged with a share in the sacrilege. No sooner had he reached Sicily than he was recalled to stand trial, but fled to Sparta and devoted all his energies to defeating his own countrymen. Soon the Spartans grew jealous of his power and influence and he was compelled to flee to the Persians. Anxious to return to his native Athens, he promised the Athenians the help of the Persians. He was recalled and made general, and won several brilliant victories, but was banished again at his first defeat. After the fall of Athens, on his way to the Persian court to seek help for his country, he was assassinated, 404 B.C.

**Alcinous** (*al-cin'o-us*), a mythical king of the island of Scheria described in the *Odyssey*. Being separated from other people, he and his people lived in unbroken peace and prosperity. The description of the king's palace with its fine furnishings, and its wonderful court containing the orchard of everbearing trees and vines is well known and is quite remarkable. The

chief employment of the people was navigation. It was said that the ships were intelligent, and without helm or pilot could find any coast or harbor. King Alcinous received Ulysses near the close of the latter's long period of wandering. He entertained him hospitably and furnished him with a ship to carry him to Ithaca. Upon its return to Scheria this ship and its sailors were transformed to stone by Neptune as a mark of his wrath for the favor shown to Ulysses.

**Al'cohol,** the spirit of fermented liquors. The word is of Arabic origin, and was originally used as the name of a kind of black paint used by Eastern women for darkening the eyes. It is not known why the word was applied to its present use. Alcohol is made from the juice of grapes, apples, etc., and from corn, grain and other materials containing starch, after the latter has been converted into sugar. When the juices or "mashes" ferment or "work", the sugar which they contain changes into the spirit alcohol. It has great affinity for water, which is to a great degree separated from it by distillation and other processes. When pure it is a deadly poison, and is the intoxicating principle in the so-called spirituous liquors. Brandy, whiskey, rum and gin, which are called distilled liquors, are about one-half alcohol; port wine about one-fourth or one-fifth, and claret and white wines one-tenth, while ale and cider have still less.

When alcohol is drunk it undergoes oxidation in the body, just as sugar, starch and other similar substances do. As a narcotic, it produces at first high spirits; then, as it gets possession of the nerves of feeling, stupidity; then when it has paralyzed the nerves of motion, insensibility; and, finally, if taken in large enough quantities, it reaches the heart and the result is death. Alcohol has many interesting properties and uses. As it never freezes at any natural temperatures, it is used in cold countries in thermometers. It is used in medicines by mixing it with drugs; in varnishes by mixing with resins and gums; and in cologne by mixing with oils. It is used in preserving specimens, as it is an antiseptic. Chemists find it a clean and valuable fuel.

**Alcott** (*awl'kot*), **Amos Bronson,** American educator, philosophical writer and one of the founders of the New England Transcendentalist school, was born at Wolcott, Conn., November 29, 1799, and died at Boston, March 4, 1888. His active life began by teaching in schools, founded by himself and on methods of his own, the teaching being imparted more by conversation than by books. Later on, he exchanged the schoolroom for the lecture platform, and became dean of the Concord School of Philosophy. At Concord, he was intimate with Emerson, Hawthorne, Thoreau and Channing, and was a frequent contributor to *The Dial.* Besides his *Table Talk* his best known work is his *Concord Days.*

**Alcott, Louisa May,** daughter of the above, was born in 1833 and died in 1888.

LOUISA MAY ALCOTT

Her books for children are perhaps the most popular works of the kind published in this country. Her *Hospital Sketches* are selections from letters written home from the army in 1863, where she was a volunteer nurse. Her best known books are *Little Women, Little Men, Old-Fashioned Girls, Eight Cousins* and *Rose in Bloom.*

**Alcuin** (*ăl'kwin*), born in England about 735 A. D., and died in France in 804. He was educated in the cathedral school at York, England, and became head master of that school. He is, perhaps, best known for his labors in the celebrated palace school opened by King Charlemagne in France. Alcuin became the head of this school and, in addition to teaching, he had corrected copies made of classical manuscripts which had gradually become very inaccurate through careless copying. During his last years, Alcuin was abbot of the monastery of St. Martin in Tours, France.

**Alden** (*awl'den*), **John** (born 1599, died 1689), one of the Pilgrim fathers, who came over in the *Mayflower* in 1620. For more than fifty years he was a magistrate of Plymouth colony. Miles Standish once sent him to a lady with an offer of marriage, but she, liking John better, said, "Prithee, John, why do you not speak for yourself?" —and John married her. The story is told by Longfellow in his *Courtship of Miles Standish.*

**Alder** (*al'dẽr*), hardy ornamental tree or shrub, fond of the water and the wood valued for its durability in water. It belongs to the genus *Alnus;* 20 species are known. A giant among these is the famous black alder of Europe, Asia and North Africa. The alder is widely distributed. In North America there are six species of trees and three of shrubs. "The alder by the river" is not only a very pretty feature of the landscape, but also of value to the land, keeping the banks from crumbling. The tree is not ranked with the more important timber trees, but is put to numerous uses; alder branches furnish the best charcoal for the making of gunpowder; from the bark and shoots is obtained a dye; the wood is turned to account in various small common articles, and is used for piles, pumps, watering-troughs, etc.

The Oregon or red alder is found in the far west, in Washington, Oregon and in the mountains of California down to Santa Barbara. It grows along streams, on canyon sides, and up on the mountains beyond the spruces. On Puget Sound the tree sometimes reaches the height of 80 feet. The bark is smooth and grayish, the leaves dark green. The wood is red-brown in color and is sometimes used for furniture.

The white alder also belongs to the west, borders mountain streams from Idaho down toward the Mexican line. It, too, is a tall tree for an alder. Very early in the year it puts forth great yellow catkins, at this season specially conspicuous and attractive. In the spring the unfolding leaves are covered with white hairs and the young shoots have a white crust. The bark is rough and dark brown in color.

The lanceleaf alder grows on high lands in Arizona and New Mexico. The paperleaf alder is another species found in the mountains of the west.

The seaside alder, an attractive small tree, is found fringing stream and pond in Delaware, Maryland and the Indian Territory. It is from 15 to 30 feet in height, its bark light brown, the leaves a gleaming dark green above, paler beneath. A feature of this tree is the beautiful yellow catkins with which it decks itself in September.

Plants of other orders are popularly called alders. Mention may be made of the winterberry or black alder, common on low grounds, closely related to the American holly, bearing thick-clustered coral-red berries, these appearing in September. The sweet pepperbush or white alder, a shrub in late summer adorned with fragrant white blossoms, grows along the New England coast.

**Al'derman, Edwin Anderson** (1861), American educator and president of the University of Virginia, was born at Wilmington, N C., and educated at the University of his native state. Of the latter, in 1896-99, he was president, when he became head of Tulane University at New Orleans, La., subsequently removing to Charlottesville, Va., to take the presidential chair at the University of Virginia.

**Aldrich** (*awl'drĭch*), **Nelson Wilmarth** (1841—), U. S. Senator (Republican) from Rhode Island, born at Foster, R. I. For six years he was a member of the Providence Common Council, in two of which he acted as president. In 1875 he was a member of the Rhode Island General Assembly and in the latter was elected speaker of the state House of Representatives. In 1878 he was returned to the Federal Congress and in 1880 was re-elected, but in the following year resigned to take a seat in the Senate. He was successively elected to the Senate (in the years 1886, 1892 and 1905), and became one of the most forceful and efficient members of that body. He had charge of the tariff bill passed in 1909. He was also chairman of the commission appointed to revise the monetary system of the country.

**Aldrich** (*awl'drĭch*), **Thomas Bailey**, an American poet and novelist, was born in Portsmouth, New Hampshire, November 11, 1836. Between the years 1881 and 1890 he was editor of the *Atlantic Monthly*. He has written *The Stillwater Tragedy*, *Story of a Bad Boy*, *Marjorie Daw*, *Prudence Palfrey*, *Judith and Holofernes* and several volumes of poems. He died March 19, 1907.

T. B. ALDRICH

**Ale.** See BEER.

**Alemanni** (*ăl'lā-măn'nē*) (meaning "all men"), a union of several tribes, who lived in the heart of Germany. They were attacked at different times in their history by nine Roman generals or emperors. They were defeated time and again, but never conquered. They were at last united with the Suevi into the dukedom of Alemannia, and thereafter their history is included in the history of Germany.

**Aleppo** (*ā-lĕp'pō*), a city of Syria, is built over the ancient city of Berœa. It is surrounded by a stone wall forty feet high and three and a half miles long. In an earthquake which occurred in 1822 two-thirds of the people were swallowed up. Outside the city beautiful gardens stretch for 12 miles to the southeast. The "boil of Aleppo" is a cancer that breaks out on the faces of children and lasts a year, leaving a scar for life, by which a citizen of the place can be easily recognized. Population, 210,000.

**Aleutian Islands or Catharine Archipelago,** a group of over 150 islands, volcanic as well as rocky in their foundation, which extend southwestward from the Alaskan peninsula across the northern Pacific and between the latter ocean and Bering Sea. They are populated by a hardy race, between 2,000 and 3,000 in number, allied to the Eskimo stock, who subsist chiefly on seals and fish. There is little agriculture, for the soil is thin and poor, and the vegetation is stunted and insignificant. The islands, which form part of Alaska and with that northwestern peninsula belong to the United States, were discovered early in the eighteenth century by Bering, the Danish navigator. The inhabitants as a rule are of a low order of

intelligence, use primitive implements in their work, and live in winter in crude dugouts and underground dwellings. They have been Christianized by Russian missionaries and are nominally attached to the Greek church. Their food, in addition to the fish they catch, includes foxes and reindeer. The Fox Islands form the larger and more populous portion of the archipelago, which extends along both sides of the parallel of 55 north latitude, separating the Northern Pacific from the Sea of Kamchatka. See ALASKA.

**Alexander.** See EMPEROR SEVERUS.

**Alexan'der the Great,** son of Philip of Macedon, was born at Pella, in 356 B. C. Gifted by nature and carefully educated by Aristotle, he early gave promise of his great character. Philip's triumphs saddened him, and he once exclaimed: "My father will leave nothing for me to do!" When only 16, he took charge of the government in his father's absence. Two years later he showed such courage in the battle of Chæronea that his father, embracing him, said: "My son, ask for thyself another kingdom, for that which I leave is too small for thee." At Philip's death, Alexander, not yet 20 years old, ascended the throne and prepared to finish the conquests which his father had begun. He struck terror into all Greece by razing Thebes to the ground and punishing all who had revolted. He then turned toward Persia. Crossing the Hellespont, in 334, he defeated the Persians in a number of battles, overthrowing the son-in-law of King Darius with his own lance. The cities of Asia opened their gates to the conqueror as he marched to meet Darius and his army of 500,000, in the defiles of Cilicia. At the pass of Gordium was the famous Gordian knot. An oracle had foretold that whoever should untie it would become master of the world, but Alexander boldly cut it with his sword. Meeting Darius between the mountains and the sea, the resistless Macedonian phalanx utterly routed the disorderly masses of the Persians in the great battle of Issus, 333 B. C. The family of the Persian monarch fell into the hands of Alexander, and all Asia, as far as the Euphrates was offered as the condition of peace; but the conqueror proudly refused, saying that Darius must regard him as the ruler of all Asia and the lord of all his people. Alexander now turned southward and conquered the eastern coast of the Mediterranean. In Egypt he restored the religious customs of the people, which the Persian rulers had changed, and built the city of Alexandria. He visited the temple of Jupiter Ammon in the Libyan desert and was hailed as a son of the god. In the spring, he routed Darius again, at the battle of Arbela (331 B. C.). He marched to the interior, entering in triumph Babylon and Susa, the storehouse of the treasures of the East, and Persepolis, the capital of Persia. But these successes turned his head, and he began to lead a life of cruelty and dissipation. In a fit of anger he killed some of his best friends, and while drunk burned the beautiful city of Persepolis. In 320 B. C., Alexander marched northward to the furthest known limits of Asia and conquered the Scythians on the banks of the Jaxartes. Two years later, he invaded India. When a king named Porus was brought to him, Alexander asked him how he would like to be treated. "Like a king," was the reply, which so pleased Alexander that he restored him his kingdom, and Porus became an ally and friend. Here his favorite horse, Bucephalus, which no one else could ride, died from a wound. Alexander gave the horse a splendid burial, and founded a town, named Bucephala, in his honor. Alexander advanced through India, until his soldiers refused to follow him further. He sailed down the Hydaspes to the Indus, thence to the Indian Ocean.

He returned to Babylon, receiving on his way ambassadors from all parts of the world. Here, while forming new plans for the future, both of conquest and civilization, he was taken sick at a banquet and died at the age of 32, after a reign of less than thirteen years, during which he had become master of most of the then known world. His body was carried to Alexandria and placed by Ptolemy in a golden coffin. The Egyptians and other nations worshiped him as a god. His vast empire was divided among his generals. When asked who should inherit his throne he replied: "the worthiest."

**Alexander I,** czar of Russia, was born November 6, 1777, and ascended the throne in 1801. He was concerned in all the wars of Napoleon, either as his enemy or as his ally. As a ruler, he was able and humane, but in his wars he was usually on the side opposed to the cause of public liberty. He died in 1825.

**Alexander II,** czar of Russia, born in 1818, succeeded his father Nicholas I as czar in 1855, during the Crimean war. By his establishment of schools and internal improvements he did more to build up Russia than any emperor since Peter the Great. He gained the name of "Liberator" by giving freedom to the serfs. He was assassinated in 1881.

ALEXANDER III

**Alexander III,** czar of Russia

was born March 10, 1845. He succeeded to the throne in 1881. He showed vigor in government and ability in repressing the Nihilists (see the latter), who made several attempts on his life, and who assassinated his father, Alexander II. The harsh laws against the Jews and the severe famine (1892), are among the later events of his reign. In 1866 he married Princess Dagmar of Denmark (sister of Alexander queen of England), whose son, Nicholas II, succeeded Alexander III on the throne. He died November 1, 1894.

**Alexander,** the name of eight popes. Alexander VI has been called the worst of the popes, because the crimes of his son, Cæsar Borgia, were attributed to him. He was a profligate, but an able statesman and did much to advance the cause of the papacy. He was born in 1431, and died in 1503. See BORGIA, CÆSAR.

**Alexander, W. J.,** born at Hamilton, Ontario. Educated at Hamilton Collegiate Institute. Matriculated University of Toronto with double scholarship, 1873. Canadian Gilchrist Scholar, 1874. Student of University College, London, England, 1874–7. B.A. University of London. Teacher in Prince of Wales College, Charlottetown, P.E.I., 1877–9. Graduate Student, Scholar and Fellow of Johns Hopkins University, Baltimore, 1879–1883. Ph.D., 1883. Graduate student in Germany, 1883–4. Professor of English Literature, Dalhousie College, Halifax, Nova Scotia, 1884–89. Professor of English, University College, Toronto, 1889—present time. He has written various books, *Introduction to the Poetry of Robert Browning; Select Poems of Shelley*; and various articles in learned periodicals.

**Alexan'dra, Queen,** consort of the late Edward VII of England, long known as Princess of Wales, daughter of the late Christian IX, of Denmark, was born at Copenhagen, December 1, 1844. On March 10, 1863, she was married at Windsor to Albert Edward (then Prince of Wales), eldest son of Queen Victoria and the Prince Consort. She has had six children, four of whom survive. Her majesty is widely loved and admired; she is a fine musician, eagerly interested in philanthropic works and devoted to her family life of which she is the center and inspiration.

QUEEN ALEXANDRA

**Alexan'dria,** a city of Egypt, founded by Alexander the Great, 332 B. C. Its site is near one of the mouths of the Nile, between the Mediterranean and Lake Mareotis. About a mile out in the sea is the island of Pharos, connected with the land by an enormous mole, on which Ptolemy built the famous lighthouse, 400 feet high, which was called one of the wonders of the world. He ordered as inscription on the lighthouse, the words: "King Ptolemy to the Gods, the Saviours, for the Benefit of Sailors." But the architect, Sostrates, put another inscription on the wall, covering it with mortar on which he wrote the words of the king. In later years the mortar fell off, and the hidden inscription appeared: "Sostrates, the Cnidian, son of Dexiphanes, to the Gods, the Saviours, for the Benefit of Sailors." The city was laid out in squares, with the tomb of Alexander the Great in the center. It was divided into the quarters of the Jews, of the Egyptians and of the Greeks. In the latter were most of the beautiful buildings for which the city was famous, the palace of the Ptolemies, the greatest of the libraries of ancient times, the museum, the court of justice and the temple of the Cæsars. This temple Julius Cæsar adorned with the two "Cleopatra's needles," which he brought from Heliopolis, and which have been given to England (1877) and to America (1880). Alexandria has been a great center of trade at different times in its history. The rise of Constantinople and the discovery of the passage to India by the Cape of Good Hope took away its importance; but the opening of the Suez canal has renewed its prosperity, and it is now growing rapidly. The city fell at various times under the power of the Romans, the Persians, the Arabs and the Turks. It was largely rebuilt under Mehemet Ali (who reigned from 1811 to 1848). In 1882 it was bombarded and held for a time by the English. It is now under English government. The modern city is built on the ancient mole. The population is 332,246, made up of a large number of nationalities.

**Alexandria, Ind.,** a growing city in Madison County, situated about 50 miles northeast of Indianapolis on two lines of railway and having trolley connection with all principal towns and cities in Indiana and Ohio. With the discovery of natural gas in 1889 its growth for a few years was remarkable. On the failure of gas it lost many industries but since 1908 has enjoyed a healthy growth. Its manufactures include glass, mineral wool, wire and paper mill products. The city owns and operates its own waterworks. Population (1910), 5,200.

**Alexandria, Va.,** a town, port of entry and railroad center in Alexandria County,

of which it is the capital, is situated on the right bank of the Potomac, six miles southwest of Washington, D. C. The tidal waters of the Chesapeake flowing up the Potomac, afford a good and roomy harbor, the river here being a mile wide. It has a number of institutions of learning, among them Potomac, Mt. Vernon and St. Mary's Academies, the Washington High School, and the Theological Seminary and High School of the Diocese of Virginia (Episcopal). The town has several buildings of historic interest, among them being Christ Church where Washington worshipped the Carlyle House, Braddock's headquarters in 1755; the school of which the first teacher was Washington: the old Town Hall, the first story of which was used by the fire brigade of which Washington was a member, etc. Alexandria has many factories, mills, machine shops and other industries. Population, 15,329.

**Alexandrian Library,** probably the largest collection of books ever gathered before the invention of printing. It was founded by Ptolemy I and Ptolemy II, of Egypt, and contained books in all languages. It was housed in two buildings, the Museum and the Serapeum. The number of volumes was said to be seven hundred thousand, but this would not amount to as much as a modern library of printed books of the same number, because at that time all books were written, and each part of a book was called a volume. Thus the *Iliad*, which now makes one volume, was then twenty-four volumes. Students came to this library from all parts of the world to study. When Julius Cæsar besieged Alexandria, a large part of the library was burned. Mark Antony, however, presented a new collection to Cleopatra from Pergamus, and the library went on increasing for four centuries, till the Serapeum was destroyed by command of the Emperor Theodosius The library was again re-established, but was burned a second time, about 640 A. D., when the Arabs conquered the city. The story is told that the Arab caliph, Omar when asked to preserve the library, said: "If these writings of the Greeks agree with the *Koran*, they are useless and need not be preserved if they disagree, they are pernicious and ought to be destroyed." So they were used to heat the four thousand baths of the city, and such was their number that six month were barely sufficient to use up the precious fuel.

**Alexiev, Admiral E. S.** Born in Russia in 1844, and educated for the navy. During the Chino-Japanese War in 1897, he was the chief of the eastern fleet; later he was the chief of the Black Sea fleet. In August, 1903, he was appointed viceroy of the Far East with supreme command of the land and naval forces. When the Russo-Japanese War broke out and the Russians met reverses, Alexiev was superseded in command both of the army and navy, and left in charge of the civil administration only. He has been severely censured for either being ignorant of the state of affairs in Japan prior to the war or for concealing his knowledge of the situation from the czar Nicholas II. Alexiev belongs to the reactionary faction in the Russian government.

**Alfalfa,** from an Arabic word meaning "the best fodder," the *Medicago sativa* of botanists, is a forage plant belonging to the botanical family *Leguminosæ*, of which all clovers, beans and peas are examples. It is known by many other names, of which the most common is lucerne; it is a perennial, with powers of indefinite reproduction from one seeding, and fields of it are claimed to have been continuously productive without reseeding for from one to two hundred years or more. It is a smooth, upright, branching plant, with leaves three parted, arranged alternately, and netted-veined, and produces many stems from one seed or root. Its flowers are purple, and appear in clusters on the stems and branches; its seed-pods are coiled spirally, each containing several seeds, which are kidney-shaped and olive green or bright egg-yellow in color.

Alfalfa is native to Asia, and was familiar to the Egyptians, Medes and Persians, Greeks and the Romans, who distributed it over large portions of southern Europe. Early in the history of the western continent the Spaniards carried alfalfa to South America. It was introduced probably about 1853 into the United States, in northern California, but attracted no great attention until more recent years. It is the richest forage plant known, and doubtless destined to come into general use in most of the states. In fact it is already grown successfully in greater or less areas in every state in the Union, whereas a few years ago its profitable production was thought possible only in the irrigated valleys of the west, being deemed adapted only to certain conditions found in the so-called semi-arid section, but it is now produced under greatly varying conditions of soils, climate and altitude, and this adaptability gives its growing a wide range. There are but two soil conditions that seem reliably against the successful growth of alfalfa, one is a soil generally wet, the other is too much soil acidity. The latter may be remedied by applications of lime, the other requires drainage. Alfalfa is exceedingly rich in protein, the property in which corn and most other crops are deficient, and hence its hay serves admirably to balance the feeding ration, saving the purchase of high-priced feeds, such as bran, for instance, which, pound for pound, it approximates in value. Its great value to the husbandmen may be further appreciated by the fact that

it yields from three to twelve tons per acre per season. One experiment station reports that "one acre of alfalfa yields as much protein as three acres of clover, as much as nine acres of timothy and twelve times as much as an acre of brome-grass." Unless a seed crop is desired, it is cut regularly whenever the first blooms appear, which in some regions is every month in the year, but three to five cuttings per annum would probably be an average range.

It restores and enriches rather than depletes the fertility of the soil in which it grows, supplying it with nitrogen collected from the atmosphere in nodules on its roots, in greatest abundance for other succeeding crops. Its long penetrating roots, reaching to great depths not only give it unusual powers of resistance to protracted dry weather, but draw from subterranean recesses large quantities of mineral elements which other crops would never reach, and decaying leave these readily available for future crops of whatever kind. The action of its wonderful root-system constitutes it in effect a gigantic subsoiler, and humus is constantly added to the soil by the decay of its fibrous roots, continually branching from the main tap-root. The soils on which alfalfa is grown are wonderfully changed in chemical elements and physical character, and it has been denominated as the greatest fertilizing and soil renovating plant known to agriculture.

Its palatability and succulence cause live stock of all kinds to eat it with extreme relish, uncured or as hay, and it is especially prized as a factor in dairy husbandry, affording at lowest cost the most important ingredients of the feeding rations. It is also used as pasturage, but ruminants such as cattle and sheep are not safely grazed upon it, owing to its liability to cause bloat (hoove), often resulting in speedy death.

No diseases of alfalfa are as yet common in America, and it is said more failures in growing it are caused by weeds than all its other enemies and pests combined. Well-prepared seed-beds and the most favorable conditions are demanded for the prosperity of the seed and the young plants during the earlier stages of their growth, if the fullest measure of success is to be attained. Wherever extensively grown, alfalfa has revolutionized the conditions of agriculture, and one of the most eminent agricultural and dairy authorities in the United States recently declared it as his belief that "the alfalfa-growing movement is the most important agricultural event of the century."

F. D. Coburn.

**Alfieri** (*ăl-fē-ā'rē*), the founder of Italian tragedy. He was born in Piedmont in 1749, and after a brief period of study at Turin traveled several years on the continent, spending his time, however, in dissipation. A few chance verses, written at the bedside of a friend, stirred in him a passion for tragedy, and he turned his energies to the study of literature. He wrote twenty-one tragedies, besides other poetry, including five odes on the American Revolution. His dramas, though simple in style, held an Italian audience spellbound. *Saul* is his most successful tragedy. Count Vittorio Alfieri died at Florence in 1803. His tomb is in the church of Santa Croce, in Florence, next to the tomb of Michael Angelo, and over it stands a monument by the sculptor Canova.

**Alfonso** (*alfon'so*), a name borne by twenty-two sovereigns in the Spanish peninsula.

**Alfonso I** of Portugal (1110–1185) was the founder of the Portuguese kingdom. He is said to have been over seven feet in height, and was a successful fighter against the Moors and Spaniards.

**Alfonso VI,** of Leon and Castile (1030–1109), inherited only a part of his father's kingdom, in which his brother and sister shared, but by a series of wars he conquered the greater part of their territories, and fought the Moors vigorously.

**Alfonso X,** of Leon and Castile, was engaged during his reign in putting down revolts, in fighting the Moors and in two attempts to make himself emperor of Germany. Era, 1221–1284.

**Alfonso V,** of Aragon, also ruler of Sicily, Sardinia and Naples, was born in 1385. His determination to conquer Naples, after long wars, at great odds, was finally successful. Alphonso was one of the best kings of his name. He was brave, showed great generalship, was generous, loved books, and gave encouragement to law and justice. He died at Naples in 1458.

**Alfonso XIII,** king of Spain, is the son of Alfonso XII of Spain and of Maria Christina, Archduchess of Austria. Alfonso XIII was born on May 17, 1886, shortly after the death of his father, and during his minority his mother acted as regent. Before he ascended the throne, there were serious uprisings in the Philippine Islands and in Cuba. In 1898 war broke out between the United States and Spain, and as a result of it Spain lost Cuba, Porto Rico and the Philippines. The young king took the oath of office May 17, 1902, and shows strong tendencies towards progressiveness in government. In 1906, he married the Princess Victoria Eugenia, daughter of the late Prince Henry of Battenburg and Princess Beatrice, youngest child of Queen Victoria of England. An heir to the throne was born May 10, 1907. Another son was born June 22, 1908.

**Alfred the Great,** king of the West Saxons, was born at Wantage, Berkshire, in 849. The youngest of four sons, he succeeded to the crown on the death of his brother Ethelred at the age of 22. He had already given proof of ability as a general

in driving back the constant invasions of the Danes, the most terrible warriors of Europe, and a large part of his reign was spent in preserving the liberty of his country against these northern foes. At first he was unsuccessful, and by 878 the invaders had overrun the entire kingdom of the West Saxons, while Alfred was driven into its forests. But he refused to be beaten, and soon the tide of fortune turned. Building a stronghold on an island in the wastes of Somersetshire, still known as Athelney (the island of the nobles), he made frequent sallies against the enemy, and soon found himself at the head of an army with which he totally defeated them. He then built England's first fleet and soon grew so powerful, both by land and sea, that he was recognized as sovereign of all England. During the years of peace which followed Alfred busied himself in rebuilding the cities which had suffered in the wars, in training the people in the use of arms and in founding those wise laws and institutions which helped so much in making England great and happy in later years. In an age of ignorance he was a fine scholar, and did much in founding schools and encouraging literature. Toward the close of his reign, after a hard contest of three years, he was again victorious over his old enemies, the Danes. He died in 901, leaving his country in peace and prosperity as the result of that wise and energetic rule which endeared him to all Englishmen as their best and greatest ruler.

Algæ (*ăl'jē*). One of the great divisions of *Thallophytes* (the lowest group of plants), being distinguished from the *Fungi* by containing the green coloring matter known as chlorophyll. This enables them to manufacture their own food and so to live independently of all other organisms. They are of special interest as representing the most primitive forms of the plant kingdom, from which all other groups of plants have probably been derived. They are exclusively water plants, either living in the water or in damp places, and are commonly known as "seaweeds," although they are abundant in fresh as well as in salt water. Their bodies are of various sizes and degrees of complexity. Some are only a single cell and are microscopic in size, while others are very complex and huge in size, as the giant kelps of the ocean. There are four great groups of *Algæ*, named for their differences in color. The *Cyanophyceæ* or blue-green algæ are the simplest, and are characterized by possessing a blue pigment in addition to the green chlorophyll, which gives them a bluish-green hue. The *Chlorophyceæ* or "green algæ" have no other pigment than the green chlorophyll. These two groups are characteristic of fresh waters, although they have their marine representatives. The two following groups are characteristic of salt waters, but have representatives in fresh waters. The *Phæophyceæ* or brown algæ have a yellowish to brown pigment in addition to the chlorophyll, which gives their bodies various shades from olive to yellow and brown. They include the common large and coarser seaweeds cast up by the waves. The *Rhodophyceæ* or red algæ have a red pigment in addition to the chlorophyll, and their graceful and often very delicate bodies, beautifully tinted with various shades of red, are among the most attractive plants of the seashore. For a further account see under the names of the four groups.

JOHN M. COULTER.

**Al'gebra** is a branch of mathematics which deals chiefly with "functions" or general values instead of special values as in arithmetic. The ancient Egyptians practised simple equations, an example being this: "Its whole added to its seventh gives 19, how much is it?" In other words, they solved the equation $\frac{x}{7}+x=19$. The Greeks added something to algebra; thus Euclid, about 300 B. C., knew that $(a+b)^2=a^2+b^2+2ab$. Other steps in advance were made in Alexandria and Persia. But algebra was only used as a help to arithmetic until Viéte or Vieta, a Frenchman, in 1591 made of it an independent science. As to the usefulness of algebra, it can only be said that it is needful to all advanced work in mathematics. Its value to the professional man or workman may not be great, except that it is well for every man to know a little of each of the branches of truth.

The teaching of algebra might well follow the historical order; and begin with simple equations as did the Egyptians. For here algebra is of obvious use in making the problems of arithmetic more simple. Let one ask the following "catch" question: "A goose weighs six pounds and half its own weight, what is the weight of the goose?" The answer is seldom given rightly without setting $x$ for the weight of the goose, thus: $x=6+\frac{x}{2}$ which gives the answer 12 pounds. It is better to begin, however, with practical questions. The most important modern change in the teaching of algebra has been brought about by Professor Chrystal, who has called attention to the nature of general functions as the real object of study in this science. A knowledge of general functions, such as the following for a quadratic equation, $ax^2+bx+c=d$, has always been implied in the teaching of algebra; but it has only lately been insisted upon. It has been usual to teach the use of root signs and signs for brackets as if they formed a part of algebra; but in reality these operations belong to pure arithmetic.

**Algeciras** (*ăl'je-sē'ras*) **International Conference,** on Morocco matters, held at Algeciras, Spain (opposite Gibraltar), in January, 1906. The Conference, after a period of extreme diplomatic tension between the European powers, caused by the exception taken by Germany to the trade control of Moro co by the Franco-British-Spanish agreement, settled matters more agreeably to Germany and signed a "General Act" embodying a concession for a state bank at Tangier, the suppression of the illicit traffic in arms, the control of the police, together with provision for an open door as regards trade and the exactions of the Customs. Later in the year, Morocco was disturbed by serious tribal disputes in the Mogador district, and by much unrest in the southern Franco-Moroccan frontier.

**Alger** (*ăl'jēr*), **Russell Alexander,** American general, politician and ex-secretary of war in President McKinley's administration, was born in Lafayette, Ohio, February 27, 1836, and was educated at Richfield Academy, Ohio, studied law, and was called to the bar. Removing to Michigan, he entered the army as captain in the Second Michigan Cavalry (1861), and two years later became colonel of the Fifth Michigan Cavalry, and subsequently reached the rank of brevet major-general of volunteers. He was severely wounded at the battle of Boonsboro, Md., July 8, 1863, and performed meritorious s rvice at Gettysburg and in the Shenandoah valley. After the war he became interested in the lumber business in Detroit, and owner of extensive timber tracts. In 1885–6, he was governor of Michigan, and on March 5, 1897, was appointed United States secretary of war. In 1901 he was elected to the United States senate, where he served until his death, January 24, 1907.

**Alge'ria,** a French colony in northern Africa, fronting on the Mediterranean, and comprising besides Northern Algeria, with 17 arrondisements and 350 communes, South Algeria, which extends far to the south and west, and embraces the vast Saharan oases organized into four territories in 1905. The area of the Algerian Sahara effectively occupied is estimated at about 193,000 square miles, including the zones, in the southwest, with a population numbering about 62,000. The two regions (North Algeria has an area of 184,474 square miles), have a total area of about 343,500 square miles, with an aggregate population in 1911 of 5,563,828, all but 795,522 Europeans being natives —Arabs, Berbers, Tunisians, Moroccans and Musulmans. The extent of French possessions in Africa is very large, its area extending from the Mediterranean, and including the region of Tunis, in the north, to the Gulf of Guinea in the south, together with the French Congo district, to the southeastward, and covering also all of French West Africa and the Sahara to the Atlantic, including French Guinea, the Ivory Coast, Dahomey, Upper Senegal and the Niger region, besides French Somaliland on the Gulf of Aden, at the foot of the Red Sea.

*Government.* The government and administration of Algeria are centralized at Algiers under a governor-general, who represents the authority of the French Republic throughout Algerian territory. He is assisted in his duties by a council; while each department sends one senator and two deputies to the French National Assembly. The revenue, estimated for 1911, of the Algerian colony was 144,549,940 francs, with an expenditure of 140,546,551; that of the southern territory, for the same year, was 5,615,244 francs, with an expenditure of 6,891 francs below the total revenue. The military force of France in the colony was, in 1911, about 56,000 of all ranks, of whom two-thirds were Europeans. The debt of Algeria (December, 1909), amounted to close upon 57½ million francs in capital and 114 million francs in annuities, interest, etc.

*Commerce and Resources.* Its annual commerce aggregates 1,078 million francs, 565 million representing imports and 513 representing exports. The chief items of the latter are living animals, wool, hides, cereals, wines, cork, tobacco, fruits, olive oil, phosphates and some iron and zinc ore, besides fish and various shell-fish. The chief cereals raised are wheat, oats, barley, maize and beans. In Algeria the animal stock is considerable, embracing in 1909, 233,243 horses, 187,339 mules, 278,250 asses, 205,106 camels, 4,006,913 goats, 9,066,916 sheep, besides 110,700 pigs and over 1,100,000 cattle.

*Transportation.* The railways of the colony, which receive state aid, were in 1910, 2,035 English miles in extent, besides 200 miles of tramway. In addition there are a considerable system of telegraphy and a fair postal service and a sound system of banking. Algiers, the capital, and chief seaport, has a population of about 110,000.

*History.* Algeria is an old country. Its prince was an ally of Hannibal, and it became a Roman province under the Cæsars. It was successfully conquered by the Vandals, by Belisarius, by the Saracens, the Morabites (an Arabian religious sect), the Spaniards and the Turks, who taught Algerines to be the dreaded pirates they were. Many thousand Europeans were captured and enslaved by them. This piracy grew so unbearable that the English, Dutch and French sent fleets at different times to suppress it. The French, at last, in 1830, conquered Algiers, but there were numerous revolts, especially that of Abd-el-

Kadir, before France became fully master of the country and the life of a Frenchman was safe outside the walls of the capital.

**Algiers** (*ăl-jeerz'*), capital of Algeria, is divided into two parts. The newer portion, along the harbor, is European; the older, on the hillside above, is Arab. It is an important French coaling station on the Mediterranean. Population (1906), 138,240.

**Algo'ma,** one of the northern districts of the province of Ontario, offers great attractions for settlers. Contains millions of acres of productive land easily reached, very suitable for live stock and dairying. Bounded by the district of Nipissing on the east. It includes the Temiskaming settlement. Its northern boundary is that of the province itself, viz.: Hudson Bay and the Albany River. These two districts of Algoma and Nipissing taken together have an area larger than that of any European country except Russia. These districts are in that belt of the world which has ever been the most famous for the production of grasses, vegetables, fruits and cereals. The important industrial center of Sault Ste. Marie, only 193 miles north from the latitude of Toronto (population 13,000), is in Algoma. The timber and mineral wealth of the district is immense. The richest and most extensive nickel belt in the whole world is in Algoma.

**Algon' quins,** one of the two great families of Indians that formerly occupied the Mississippi Valley and the regions east of it. The Indians of New England were Algonquins. The largest tribe left is the Chippewas.

**Algon'quin National Park.** In northern part of the province of Ontario (from 1,500 to 2,000 feet above sea level). On the Ottawa division of the Grand Trunk Railway, which extends into the park itself, only 200 miles north of Toronto (quickly and comfortably reached), and 175 miles west of Ottawa, the capital city of Canada. Most attractive to travelers and tourists. A magnificent preserve set apart by the province for a park; beautiful lakes and rivers, 1,200 in number; abundance of fish. Wild forests of heavy timber and pure, health-restoring air; a total area of 1,800,000 acres of forest, lake and stream; called Lakeland. Red deer and moose (hunting not allowed in the park) plentiful and increasing in number. The highest summer resort in eastern Canada. The railway stations are located on picturesque lakes. Teeming with fish (speckled, gray and salmon trout). A paradise for campers. The Naganetawan River takes its rise in the park.

**Alhambra** (*ăl-hăm'brā*), the ancient fortress and residence of the Moorish monarchs of Granada, situated on a hill overlooking the city of Granada, Spain. This famous palace was built between 1248 and 1354, and though greatly marred by its Spanish conquerors in succeeding ages still contains marvels of beauty, taste and ingenuity. The surrounding gardens, with their wat rfalls, fountains and shady ravines, caused the Arab poet to liken the whole effect to "a pearl set around with emeralds." It is divided into countless apartments, vast halls, ranges of bedrooms and summer rooms, whispering galleries, a labyrinth and vaulted tombs. Passages from the *Koran* adorn the various walls. Among the most famous courts are the Hall of Ambassadors, with its splendid throne of the sultan, and the Court of the Lions, with its magnificent fountain, supported by twelve marble lions. A famous description of this palace is to be found in Washington Irving's *Alhambra.*

**Alicante** (*ă'lĭ-kăn'tā*), **Spain,** a province of the Spanish kingdom, area 2,185 square miles, with a population (1910) of 483,986; also a strongly fortified town and seaport on the Mediterranean, situated north of Cartagena and south of Valencia, population (1910) 51,165. Here, on an eminence overlooking the sea, is the castle of Santa Barbara. The town, which is a delightful seaside resort, is picturesquely situated, and has a picture gallery, library, several parish churches, two nunneries and a number of fine squares and promenades. Being the port of its own and the Valencia province, its export trade is considerable, chiefly of wine, oil, tobacco, silk and grain. There is a resident United States consul in the town.

**Alison** (*ăl'i-son*), **Sir Archibald** (born 1792, died 1867), an English historian. His work, the *History of Europe*, covers the period from the French Revolution to the Peace of 1815. It was in its day very popular and had a sale of over five hundred thousand volumes. It, however, is not of the highest authority, because of its author's partisanship and its many inaccuracies.

**Al' kali,** an old chemical term used to denote soluble caustic hydroxides. The alkalies proper are potash, soda, lithia, rubidium and cæsium hydroxides and ammonia. Potash is called the vegetable alkali, soda the mineral alkali and ammonia the volatile alkali. Lime, magnesia, baryta and strontia are called alkaline earths, because they have some of the properties of alkalies. That which especially distinguishes an alkaline substance is the power it has of turning a vegetable blue, green; or a vegetable yellow, reddish brown. Alkalies belong to a general class of substances called bases, which are oxides of metals (usually combined with water), or compounds containing carbon and nitrogen called organic bases, all of which unite with acids to form salts. Alkalies and acids neutralize each other, and the usual caustic or bitter taste of the alkali and the sour taste of the acid usually disappear when a salt is formed. A familiar

example is the addition of soda (alkali) to sour milk (acid), which neutralizes the acid, or destroys the sour taste. An alkali also unites with oil or fat to make soap.

**Al' kaloids,** a class of substances that occur in plants, some of which are very poisonous, and many are very valuable medicines. All of them are bases, that is, they unite with acids to form salts, and in many cases the salts are used medicinally. All alkaloids contain carbon, nitrogen and hydrogen and usually oxygen also. Some of the most important alkaloids are theine of coffee and tea, nicotine of tobacco, morphine from opium, quinine from Peruvian bark, as well as strychnine, atropine, cocaine etc.

**Allahabad** (*ă-lă-hă-băd'*), capital of the northwestern provinces of India. The name of the place means "City of God." It is built at the junction of the Ganges and Jumna Rivers. Its fort is strong and commands both rivers. Within the fort are the remains of a splendid palace of the Emperor Akbar. Many Hindus make pilgrimages to Allahabad because of its sacred rivers. It also forms the junction of the great railway system that unites Bengal with Central India and Bombay. Population about 172,000.

**Allan, Hon. George W.,** born in Toronto in 1822. Educated at Upper Canada College. Called to the bar in 1846. Was Chancellor of Trinity College, Toronto; a fellow of the Royal Geological Society (England); was mayor of Toronto in 1855; a legislative councillor from 1858 to 1867; called to the Senate of Canada in 1867; speaker of the Senate from 1888 to 1891. He died in 1901.

**Allan, Sir Hugh,** born in Ayrshire, Scotland, 1810. His father was a ship master; entered a counting house at the age of 13, went to Canada in 1826. In 1851, the firm of which he was a member began to build iron screw-steamships, and their first boat, "The Canadian," made its first trip in 1853. In 1854 the mail service was begun. It has continued ever since. The history of the Allan firm is that of Canadian maritime commerce. Their fleet has long been one of the first in point of general merit in the world. Their steamers have been used as transport ships by the British Government. A director of several important industrial concerns; received knighthood in recognition of his great services to foreign and domestic commerce; died December 8, 1892.

**Alleghany** (*al'e-ga'ni*) or **Appalachian Mountains,** the great range of mountains which extend from Canada to the northern part of Alabama. The greatest width of the main range is in Pennsylvania and Maryland, about 100 miles in extent, and its length is 1,300 miles. While varying little in height, the ridges follow a remarkably straight course, sometimes keeping an almost straight line for 50 or 60 miles. Included in this range are the Green Mountains of Vermont, the Highlands of the Hudson, the Catskills, the Blue Ridge and west of it the Alleghanies proper. Nowhere do these mountains reach the snow line. Mitchell's Peak, in North Carolina, 6,688 feet, is the highest point, while Mt. Washington, in New Hampshire, 6,293 feet high, is the most famous peak. The Alleghanies are one of the great sources of supply for the whole country of iron and coal.

**Allegheny,** formerly a separate city at the junction of the Allegheny and Monongahela Rivers opposite Pittsburgh (q. v.) was united in 1907 with Pittsburgh, with which it is connected by numerous bridges and electric lines. Surrounding the main business section is City Park of 100 acres and farther out Riverview Park (219 acres), in which is the Allegheny Astronomical Observatory. The Carnegie Library and three theological seminaries, the Presbyterian, United Presbyterian and Reformed Presbyterian, are located here. Allegheny, as a separate corporation, had a flourishing and efficient public school system which is now a part of that of Greater Pittsburgh. The University of Pittsburgh, originally the Western University of Pennsylvania and located in Allegheny, is now in Pittsburgh. On the hills are the beautiful homes of wealthy men and the city is noted for its numerous and handsome churches. Its manufacturing interests extend for miles along the river front and include slaughtering and meat-packing, rolling mills, foundries and machine-shops, preparation of pickles, preserves and sauces, works for making locomotives and railroad equipment, structural iron and plumbers' supplies. Vast quantities of coal are shipped down the Ohio. A curious and interesting fact in the history of Allegheny is that it suffered severely in 1874 from a fire started by a boy's firecracker on July 4. Its public institutions include the Riverside State Penitentiary, hospitals, homes for orphans and the friendless, and an industrial school.

**Allegheny River** rises in Potter County, Pa., and flows northwest into New York, then south-southwest, and, after a course of 400 miles, unites at Pittsburg with the Monongahela to form the Ohio. It is navigable for small boats for a short distance.

**Allen, Charles Grant,** a Canadian naturalist and story-teller, of Scotch parentage, who won fame in England as an exponent of evolution, a popular writer on scientific subjects and a psychological novelist. He was, perhaps, most at home in the popular essay, in the field of æsthetics and semi-science. He has written delightfully on flowers, birds and insects as well as in the realm of fiction. His best known works are, in novels, *The Tents of Shem* and *The Woman Who Did*, and in popular science, *The Evolutionist at Large*, *Vignettes from Nature* and *Science in Arcady*.

As a disciple of the great evolutionist of the age, he wrote a sympathetic *Life of Darwin* for the series of "English Worthies."

**Al'len, Ethan** (born 1737, died 1789), a brigadier-general in the American revolutionary army. In 1775, after the battle of Lexington, he gathered a small company of his "Green Mountain Boys" and marched against the fortresses of Ticonderoga and Crown Point. Landing with 93 men, just before daybreak, he surprised the fort, getting inside and forming his men on the parade ground where they awoke the sleeping garrison with a shout of victory. The British commander rushed out in his nightclothes and asked: "What does this mean?" He was ordered to surrender. "In whose name?" he asked. "In the name of the Great Jehovah and the Continental Congress," replied Allen, and the fort was surrendered. In the attempt to take Montreal, at the head of a small body of troops, he was captured after a sharp engagement and sent to England. After his release and return to America, he was appointed commander of the Vermont state militia.

ETHAN ALLEN

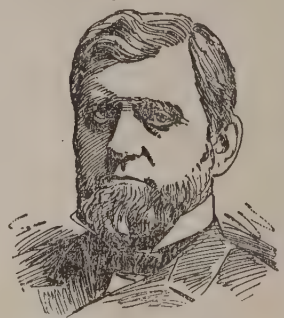
**Allen, James Lane,** American *littérateur* and novelist, hails from the Blue Grass region of Kentucky, having been born near Lexington, Ky., in 1849. After graduating at Transylvania University, he taught Latin and the higher English branches at Bethany College, West Virginia, though, since 1885, he has devoted himself entirely to literature. He is a delightful and realistic writer, and in all his books he shows himself to be an ardent lover of nature. His early work consisted of sketches and studies, dealing thoughtfully and freshly with Kentucky life, contributed to *Harper's Magazine* and *The Century*. His novels, most of which have an historic background in his loved Kentucky state, include *A Kentucky Cardinal*, *The Choir Invisible*, *Two Gentlemen of Kentucky*, *Aftermath*, *Flute and Violin* and *The Reign of Law*.

**Allentown, Pa.,** the county seat of Lehigh County, was incorporated as a borough in 1826. It is situated at the junction of the Lehigh and Little Lehigh Rivers. It has excellent natural drainage and is located in a rich agricultural district. It originally was known as Northampton. It was named Allentown in honor of James Allen, who at one time owned the greater part of the land on which it is built. There are several beautiful springs near Allentown, which are justly admired by all who have seen them. Allentown has excellent railroad facilities, and its trolley lines, radiating in every direction, make it easy of approach from all sides. Its proximity to the cement and slate regions of the county furnishes employment to many of its people. Owing to the depreciation of blast furnaces in the east, these have been supplanted by the wire mill, furniture and shoe factories, silk and jute mills and other industries. It has a school population of over 10,000, and is also the seat of Muhlenburg College and the Allentown College for Women. It has a population of 61,901.

**Alli'ance,** a city of Stark County, Ohio, situated on the Mahoning River, 56 miles from Cleveland. It is in a fine agricultural region and has importance as a manufacturing city. Among its products are agricultural implements, terra-cotta ware, white lead; and its steel works manufacture boilers, cranes, steam hammers, drop forgings and structural iron. Alliance was incorporated as a city in 1854, and its most important school, Mount Union College, was established in 1850, when the settlement was called Freedom. It has the service of several railroads, and the population is 15,083.

**Al'ligator,** a large reptile found in the rivers and swamps of the southern United States, and also in South America. It is closely related to the crocodile of the Eastern Hemisphere, and is commonly confused with it, but differs in having a broader head, a blunter snout, more teeth and other small peculiarities. The adults rarely attain 12 feet in length. Its back and sides are covered with very hard plates, but it is easily wounded in the belly. Its natural food is fish, muskrats, etc., and it is extremely fond of dog-meat. The female alligator lays from 50 to 60 eggs and buries them in sand, where the heat of the sun hatches them. As soon as hatched the young seek the water. Many doubtful stories are in circulation regarding the habits of both adults and the young.

**Al'lison, William B.,** an American statesman, was born in Ohio in 1829. He went to Iowa and was on the governor's staff, helping to enlist volunteers at the outbreak of the war. He was elected to Congress in 1862 and served four terms in the house. In 1873 he was made United States senator, and was re-elected in 1878, 1884, 1890, 1896, 1902 and 1908. He died Aug. 4, 1908.



WILLIAM B. ALLISON

ALLIGATOR EGGS AND YOUNG ALLIGATORS JUST HATCHED

**Al'litera'tion** is the frequent recurrence, met with often in English poetry and occasionally in prose composition, of the same letter or sound at the beginning of recurring words. "Alliteration's artful aid" is a familiar example. Instances of it are often met with in the Elizabethan writers and in those of early Anglo-Saxon times, chiefly in the poets. Examples are occasionally found in prose, where, when skilfully used and combined with assonance, alliteration heightens the effect of what is written or said; but its use, in both prose and verse, is often more of a trick in a writer, and should therefore be sparingly indulged in. In Shakespeare it is often met with, as in the phrase occurring in the song in *The Tempest*, "full fathom five thy father lies"; it is also frequently found in Spenser, and in Langland's *Piers Plowman*, as well as in the modern German writers, such as Goethe and Heine, where it is occasionally used with pleasing effect. Fine examples are also to be found in Tennyson and Swinburne. Among other modern English authors Coleridge, moreover, uses it as an embellishment of his verse, thus:

"The fair breeze blew, the white foam flew,
The furrow followed free."

How much the use of alliteration is the mere trick of a writer may be seen in the couplet:

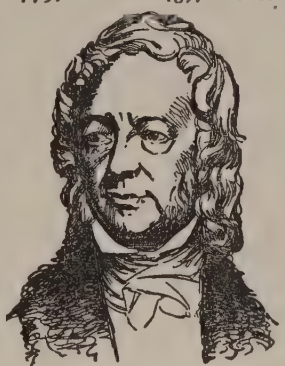
"Cossack commanders cannonading come,
Dealing destruction's devastating doom."

Much of alliteration's use will moreover be familiar to many in the proverbs and phrases in current speech, as in "life and limb," "out of house and home," "the bonnie bairn," "with peril and pain," "warring words," "the scum of the streets," "a vile varlet," "a dainty dame," "zeal, zest," "a rascally rogue," "the merry month of May," etc. See Guest's *English Rhythms*.

**Allotropy** (*ăl-lŏt'rô-pў*) or **Allotropism**, a chemical term to explain a conversion or change in physical property, but not in substance, in certain bodies. More explicitly, it is the property or capability which certain bodies show of assuming different forms and qualities under a presumed diversity of molecular arrangement. Examples of allotropic conditions are seen in carbon, sulphur, phosphorus and oxygen; practical instances are carbon (1) in its soft state, as in plumbago, black lead and charcoal and (2) (hard and crystallized) as in the diamond. Phosphorus is another instance of this dual property: (1) as a colorless wax-like solid, poisonous and dangerously inflammable and (2) as a red powder with neither of these destructive qualities. Similar contrasts are seen in oxygen and ozone.

**Alloy'**, a mixture of two or more metals melted together. Some of the metals, when combined with other metals, are rendered more serviceable for certain uses. Thus copper alone is not fit for castings, and is too tough to be easily worked by tools, but when alloyed with zinc, forming brass, it can be cast, rolled or turned. Gold and silver, also, when pure are very soft and easily worn out. They are hardened by alloying them with other metals in different proportions. The silver coins of the United States are made up of nine parts of silver and one of copper, while the gold coins consist of nine parts gold and the other part is divided into one-quarter silver and three-quarters copper. Alloys are generally harder and much more fusible than would be indicated by the hardness and fusibility of the component metals. Besides the alloys that have been mentioned, some important ones are bell-metal and bronze, consisting of copper and tin; type-metal, containing lead and antimony and sometimes tin also; German-silver, composed of copper, nickel and zinc; and solder, which is ordinarily made of lead and tin. Alloys of which one metal is mercury are called amalgams.

**Allston** (*awl'ston*), **Washington** (born 1779, died 1843), an American historical painter and poet. A native of South Carolina, he was graduated at Harvard in 1800. He pursued the study of his art in Charleston, London, Paris and Rome. During his studies he formed a close friendship with the great painter, Benjamin West, and also with Coleridge and Thorwaldsen. He practised his profession mainly at Boston and Cambridge. Allston was of a deeply religious nature, and many of his pictures are scenes from the Bible. As a writer, he was also eminent. His friend Coleridge says of him that he was surpassed by no man of his age in artistic and poetic genius.


WASHINGTON ALLSTON

**Allu'vium**, the name given to the masses of sand, earth and gravel brought down by currents of water and spread over plains, forming what is called alluvial land. Thus the Ganges, the Nile, the Amazon and the Mississippi have formed their deltas. It is estimated that the Mississippi every year carries down enough sediment to cover 268 square miles of land with a layer of earth one foot deep. The so-called bottom lands are those formed by alluvial deposits. Along rivers it is sometimes formed into terraces by the rising of floods to different heights.

**Alma** (*ăl'ma*), a small river in the Crimea. Here was fought an important battle in the

Crimean War, between the Russians (36,000 men and 122 guns), and the English, French and Turks (62,000 men and 128 guns). The Russians, though intrenched, were defeated, and the road to Sebastopol was opened.

**Almagro, Diego D'** (*ăl-mä'grō, dē-ā'gō*) (born 1464, died 1538), one of Pizarro's officers during the conquest of Peru. He was named from the Spanish town where he was picked up as a foundling. In Peru he became famous and wealthy, though he could neither read nor write. After Peru had been conquered, he began the conquest of Chile, but, recalled by a Peruvian rebellion, subdued it and captured Cuzco. He quarreled with Pizarro, was attacked, defeated and imprisoned by him, and put to death by his order.

**Almanacs** (*al'mă-năks*), or books in which information is given about the seasons, the sun and moon, eclipses and other phenomena of astronomy, are at least as old as the fifth century after Christ, when they were in use in Alexandria. They may be much older, and of Asiatic origin. With the invention of printing they became common in Europe. They generally contained predictions, the most famous of which was one that happened to be correct, in which Nostradamus foretold the death of Henry II of France. In America the best known almanac was that of Franklin, called *Poor Richard's*, and begun in 1732. Until 1828, when the Society for the Diffusion of Useful Knowledge issued a valuable English almanac, most of those which were sold were either useless for practical purposes or else full of coarse and superstitious remarks. Since that date, however, almanacs have either been published for their practical utility or else for advertisement. In the former class may be mentioned firstly the *Nautical Almanac*, published by the British Government since 1767, which is quite necessary to navigators; secondly, the French *Connaissance des Temps;* thirdly, the German *Astronomisches Jahrbuch;* and finally the United States *American Ephemeris* and *Nautical Almanac*. Very good almanacs are published yearly by some of the great American newspapers; such as the *World* and the *Tribune;* and in these may often be found the exact date of events which are remote enough to be forgotten, but too recent to be readily found in books of reference.

LAWRENCE ALMA-TADEMA

**Alma-Tadema** (*ăl'mă-tăd'ā-mă*), **Sir Lawrence** a distinguished British artist, was born at Dronryp, in the Netherlands, January 8, 1836. He settled in England in 1873 where he was given knighthood and made a Royal Academician. His paintings chiefly deal with classical subjects, and are distinguished for their careful composition and accuracy and for the beauty and finish of their coloring. In 1905 he received the Order of Merit. *Entrance to a Roman Theater* and *The Vintage*, are two of his works. His later paintings include *The Way to the Temple, A Reading from Homer, Sappho, A Roman Emperor* and *The Triumph of Titus*. He died June 24, 1912.

**Al'mond** (*ä-mŭnd*). A species of *Prunus*, a genus of the rose family. The almond is very old in cultivation, and is probably a native of the Mediterranean region. The two races of almonds are known as the "bitter" and the "sweet," the kernel of the former being used in the manufacture of flavoring extracts and of prussic acid. The sweet almonds, with their edible kernels, are grouped under two heads: those with hard shells and those with soft shells. The almond of commerce belongs to the soft-shelled group, and those with the thinnest shells are known as "paper shells." The commercial cultivation of the almond in the United States is confined to the west, chiefly California. A large part of the almonds used in this country comes from Italy, France and Spain. A native almond is found in southern California, a low bushy shrub with a small, smooth nut Both the almond and the dwarf almond of southern Russia are used as ornamental trees, planted in places not favorable for the production of the nut.

ALMOND

**Alpaca** (*al-pak'a*), an animal native to the lofty tablelands and mountains of the Andes in Peru. It is related to the camels of the old world, and is kept as a beast of burden by the Peruvian Indians. The wool is of fine quality, usually pale brown in color; but gray and even black varieties are common. The wool grows about eight inches long, when shorn regularly every year, but grows longer when not clipped. As soon as the animal is shorn its resemblance to a small camel without a hump is evident.

**Alpena, Mich.,** county seat of Alpena County, situated at the head of Thunder Bay, Lake Huron, about half-way between Saginaw Bay and the Straits of Mackinac. It has a commodious harbor and extensive shipping facilities by boat, and two railroads. The city has a variety of industries such as paper from

wood pulp, excelsior and veneer mills, woolen and knitting works, iron foundries, tanneries, flouring mills, etc. It has two of the largest limestone quarries and cement factories in the United States. It has many public and parochial schools and churches and a public library; it maintains its own water works and electric lighting system; has many miles of paved streets and cement walks, a beautiful park system. Population 13,700.

**Alps,** the largest and highest mountains in Europe. The average height of the central chain is 7,700 feet, a region where snow never melts, while several hundred peaks rise still higher. From these snow-capped mountains the avalanches rush down, sweeping along snow, rocks, forests and even villages. Here, also, in the valleys between the peaks, gather the huge masses of snow which form the long streams of ice called glaciers (see GLACIERS). The most beautiful of these glaciers is the Mer de Glace. The highest peak is Mt. Blanc, 15,732 feet in height; though Monte Rosa, the Matterhorn and several others are almost as high. There are some sixteen great passes over the Alps. Famous marches have been made over them by large armies: Hannibal's march was through the Little St. Bernard Pass and Napoleon's through the Great St. Bernard. Bridges terraces and long galleries have been built of stone to give protection against avalanches and whirlwinds. Places of shelter from storms, called hospices, have also been erected, where huge St. Bernard dogs are kept to help in searching for unfortunate wanderers who may be lost in the snow. The Alps are now pierced by four railroad tunnels, the Arlberg, Mt. Cenis, Mt. St. Gothard and Simplon. The scenery of the Alps is famous for its grandeur, and every season the mountains are so crowded with tourists that the Alps have been called "the play-ground of Europe." Of the many objects of grandeur or beauty, the most famous are Mt. Blanc and the Valley of the Chamouni. Austria, Switzerland, Italy, France and Bavaria share in the possession of the Alps.

**Al'sace-Lorraine'** (*ăl-sās'lor-rān'*), an imperial territory of the German empire, composed of Alsace and those parts of Lorraine conquered from France in the war of 1870. It does not belong to any state of Germany, but is subject to the emperor directly, who appoints the governor or *statthalter*. The language spoken is generally German in Alsace and French in Lorraine. The country is a great wine-producing one, and is also engaged in the mining of ores and the manufacture of cotton. The principal city is Strassburg (population 167,678). Area 5,604 square miles; population of Alsace-Lorraine 1,871,702. In 1911 there were in the Reichsland 1303 miles of railway.

**Altai** (*ăl-tī'*) **Mountains,** a group of mountains in Central Asia separating the tablelands of Mongolia from Siberia. The great Siberian rivers, the Obi, the Irtish and Yenisei, have their sources in these mountains. The highest peaks are over 12,000 feet above the level of the sea.

**Alterna'tion of Genera'tions.** In all plant groups above the *Thallophytes*, the life history of every plant is made up of two phases. One phase bears the sex organs, and is called the gametophyte; the other bears no sex organs, but produces asexual spores, and is called the sporophyte. These two phases or generations regularly alternate with each other, the gametophyte by means of its sex organs producing the sporophyte, and the sporophyte by means of its asexual spores producing the gametophyte. For example, in the mosses the ordinary leafy plant is the gametophyte, and the so-called fruit is the sporophyte. In the ferns the leafy plant is the sporophyte, while the gametophyte is a very small but independent body, which is never observed except by those who know of its presence. In the flowering plants the whole visible body is the sporophyte; while the gametophyte is so minute that it is effectually concealed from ordinary observation. For a further account see GAMETOPHYTE and SPOROPHYTE.

**Alton,** a thriving city, railroad center and port of entry in Madison County, Illinois. It is situated on the Mississippi, 25 miles above St. Louis and about 14 miles above the mouth of the Missouri. It is built on high limestone bluffs. The Mississippi is here bridged by the Burlington railroad. An electric railway connects Alton with St. Louis and with Upper Alton, the seat of the Baptist Shurtleff College. The town has a Roman Catholic cathedral, many other churches and schools and a number of important manufactories, the most important being the Illinois Glass Works. Population, 17,528.

**Altoo'na** is in Blair County, Pennsylvania, and is situated at the eastern base of the Allegheny Mountains, 1,168 feet above the level of the sea. The surrounding country is noted for its scenic beauty. A few miles west is the famous Horseshoe Bend; several miles north is Wopsononoc Mountain, from whose summit there is spread before the eye a panoramic view of the Blue Juniata; and to the east is Sinking Valley, with its interesting natural curiosities.

In the year 1849, the time at which it may be said Altoona was founded, the officers of the Pennsylvania Railroad company selected the site of the city for the location of their principal workshops. Later the testing department, laboratories and offices were removed to the city, and at present the car and engine manufactories are the most extensive of the kind in the world. Other prominent industries are silk mills and glass works. Altoona is the terminus of a division

of the main line of the Pennsylvania railroad, and passengers have the convenience of 82 daily trains. Branch roads extend south and southeast.

In the summer of 1858, the Altoona Mechanics' Library and Reading Room Association was organized. The high school has a four years' course of study, divided into four courses, namely, vocational, commercial, general and industrial. The Pennsylvania Railroad company has donated to this school one of the most complete equipments for wood working, forge, foundry and metal machinery to be found in the country, and the High School building was erected at a cost of half a million dollars. The parochial schools have a large enrollment. The emphasis on vocational education in Altoona and the skill with which the system has been developed and applied will make the reading of the *School System at Gary* of particular interest and value in this connection. Population, 52,127.

**Alum,** common alum, a sulphate of potassium and aluminum, is a salt used in the arts and in medicine. It forms colorless, octahedral crystals containing much water. It is sometimes found in a natural state, but is usually manufactured. There are several kinds of alum, and the one containing ammonium in place of potassium is often used instead of the more common compound. Alum is used in the manufacture of calico, in tanning and dyeing, Mixed in the milk it helps in the separation of the butter, and bakers sometimes use it to whiten their bread. If added in small quantities to turbid water, in a few minutes it will make it perfectly clear without any bad taste or quality, but it should be used with caution in articles of food and drink on account of its astringent properties.

**Alu'minum** or **Alumin'ium,** a white metal like tin in appearance. It is the most abundant of the metals, being found in clay, marl, feldspar, slate, mica and many other minerals, but it cannot be cheaply manufactured although great improvement has been made in this direction. (See METALLURGY.) It may be rolled into very thin foil and drawn into very fine wire, and when rolled it becomes harder. When struck it gives forth a very musical sound, and hence is sometimes used for making bells. It is a light metal of about the weight of porcelain, and for many purposes is more convenient than silver. It makes useful alloys; with copper it makes an alloy resembling fine brass, called aluminum-bronze. This alloy is used in cheap jewelry and is adapted for gun metal. It also forms a very useful alloy with silver. It is now used for cooking utensils and a wide variety of other products.

**Alva** (*ăl'vă*), **Duke of,** a Spanish general, was born in 1508. When a mere boy he gained distinction at the battle of Pavia, and at the age of 29 defended the town of Perpignan against the dauphin of France. He soon rose to be commander of the Spanish army. In 1567, at the head of 10,000 men, he marched into the Netherlands with unlimited powers from Philip II of Spain to proceed against the heretics there. The Court of Blood, which he established here, soon became widely known and feared, and Alva boasted that he had sent 18,000 men to execution. But this great cruelty led to the revolt, which afterward made the Low Countries independent. Alva was recalled to Spain, soon after imprisoned, and, though set free when a skillful general was needed to lead an army against Portugal, he never regained the confidence of Philip. He was able, cruel and proud. His pride is shown by his reply to Philip's demand for an account of the treasure he had captured at Lisbon. "If the king asks me for an account," said Alva, "I will make him a statement of kingdoms preserved or conquered, of signal victories, of successful sieges and of sixty years' service." Nothing more was said about the account. He died in 1582.

**Amade'us,** a name very common in the ruling family of Savoy. Those of the name most famous were: AMADEUS V, Count of Savoy (born 1249, died 1323), called the Great. His most celebrated exploit was his repulse of the Turks from the Island of Rhodes, then held by the Knights of St. John. In memory of this victory, a Maltese cross, with the letters F. E. R. T. (*Fortitudo ejus Rhodum tenuit*—"His bravery saved Rhodes,"), was made the coat of arms of the family. AMADEUS VIII, count and first duke of Savoy, was born 1383, and died 1451. After a few years of rule, he retired to a monastery, Ripaille, where he lived a life of luxury. In 1439, he was elected to succeed Pope Eugenius IV, who had been deposed, but after a few years he resigned in favor of Nicholas V. As pope, he was called Felix V.

**Am'adis of Gaul,** the mythical hero of one of the early romances of chivalry; a model knight-errant, of whom Don Quixote is the caricature. The romance was written by a Portuguese courtier, Vasco de Lobeira (who died in 1403), and has been translated into various languages. Amadis, the son of a king of Gaul, had a number of adventures in a great many countries, and crowned his exploits by marrying Oriana, daughter of Lisuarte, an early king of England. The period of the story is about the beginning of the Christian era.

**Amagat, Emile Hilaire,** a distinguished French physicist, born at St. Satur in 1841. He has enormously extended our knowledge of fluids, especially concerning the compressibility of gases at high pressures. This work was done while he held the chair of physics in the *Faculté Libre des Sciences* at Lyons

Since 1891 has held an official position in the *École Polytechnique* at Paris.

**Amal'gam,** an alloy of metals, one of which is mercury. Mercury has the power of dissolving almost all other metals and mixing with them, and so is much used in separating gold and silver from their ores. (See METALLURGY.) Amalgams are very numerous, and many of them are used largely in the arts. Tin amalgam is used for silvering mirrors; gold and silver amalgam in gilding and resilvering; cadmium and copper amalgam in dentistry; and zinc and tin amalgam for the rubbers of electrical machines. Amalgams are variously made; some by merely rubbing together the two metals, others by the aid of an electric current. Some amalgams are solid, while others are liquid. The mercury can be distilled off from most amalgams by heating them in retorts. This is the way in which gold and silver are recovered from their amalgams.

**Am'aranth** (meaning unfading), a class of plants of which the flowers are composed of dry, colored scales and which retain their colors for a long time after they are plucked. Because of this fact the flowers are made emblems of immortality, and are frequently so used in poetry. The cockscomb, prince's feather, love-lies-bleeding and globe amaranth are common kinds of this plant.

**Amarillo** (*ăm'ă-rĭl'ō*), a city, county seat of Potter County, Texas, 337 miles northwest of Ft. Worth and 275 miles west of Oklahoma City. It is 3600 feet above sea level, and enjoys a clear bracing air and a salubrious climate. It is the most important city of the Panhandle country, which in former years was devoted to grazing, but now wherever cultivated yields profitable crops. It has produced Indian corn, sorghum, maize, wheat, oats, rye, besides vegetables, melons, fruit and in the southern portion cotton. Amarilllo has a good county court house and jail, a handsome city hall, two opera houses and an Elks' Lodge, besides several fine churches and good schools. It has three ice factories, marble, concrete-block, broom and candy factories, a flouring mill, grain elevator, brick works, etc. The city has four banks, water works, electric light, street cars and all adjuncts of a modern city. It is served by the Santa Fe, the Fort Worth and Denver and the Rock Island Railroad. The Santa Fe has yards and shops here; the Denver and the Rock Island each have offices and round houses. Population, 19,124.

**Am'azon,** a river of South America, flowing easterly from the Andes to the Atlantic, where it empties below the equator. It is the largest river on the globe, but not the longest. Its length is estimated at from 3,000 to 4,000 miles; its width, at its mouth, is 60 miles; it is four miles wide 1,000 miles from the sea; and more than a mile wide 2,000 miles from the sea. Its depth for 750 miles is nowhere less than 175 feet. Over 350 branches and lesser tributaries form its main trunk, and the whole system drains an area of 2,500,000 square miles, or more than a third part of South America. While large vessels can sail from the sea over the main river and its branches, the volume of water is perceptible in the ocean 200 miles from the coast, and the influence of the tides is felt 400 miles from its mouth. The forests are very extensive, being so twisted and matted and interlaced with trees, vines and shrubs, as to present an almost impassable barrier. This "sea of verdure," a traveler says, "extends in an unbroken, evergreen circle of 1,100 miles in diameter." The mouth of the Amazon was discovered by Pinzon in 1500. It was not ascended until forty years later. It is navigable for over 2,000 miles, and with its branches it affords 16,000 miles of navigable waters.

**Am'azons,** in Greek legend, a war-like race of women living in Asia Minor near the shore of the Black Sea. The mythical town of Themiscyra, on the river Thermodon, was the capital of their state. Their name probably came from a Greek word, meaning breastless, and referred to their habit of cutting off the right breast to give them greater freedom in the use of the bow. The Greeks told a number of stories of their contests with these women. The heroes, Bellerophon and Hercules, defeated them, and Theseus of Athens captured their princess Antiope. In revenge they invaded Attica and were defeated. They also fought in the Trojan War against the Greeks, and Achilles engaged in single combat and slew their queen, Penthesilea. They are represented in Greek sculpture armed with a bow, spear and axe, and carrying a half-shield.

**Ambas'sador,** an accredited diplomat of note and eminence sent by one nation, country or state to represent his country at a foreign court, nation or capital, and be the chief medium of diplomatic intercourse between them. In this high representative capacity the ambassador has right of audience with the sovereign or chief of the nation to which he is accredited, besides possessing or being accorded certain other privileges and immunities, including precedence on ceremonial occasions and at state functions over all save princes of the blood.

In its early history, the United States withheld for long the rank and title of ambassador to its accredited representatives abroad at foreign courts; but in 1893 Congress, when acting on the diplomatic or consular appropriation bill of that year, empowered the President to raise American plenipotentiaries and ministers at foreign courts and capitals of note to the rank of ambassadors, especially where these foreign courts and nations were represented at Washington by a plenipotentiary of equal

rank. This was done, and the rule and practice are still in force.

**Am'ber** is a hard, brittle, yellow substance. It is found in large and small pieces; the largest are in the museum at Berlin, weighing eighteen pounds. It is found mostly clinging to seaweed along the shores of the Baltic Sea, where divers dive for it and dredgers throw it up on the shore for women and children to gather and pick over. Some is found in New Jersey, Massachusetts and Maryland. When amber is rubbed, it develops electricity, and attracts light substances. This quality very much astonished the ancients, and they gave it the name "electron," from which we have the word "electricity." It is used mostly for beads, ornaments and mouthpieces for tobacco pipes, though large amber dishes have been found, showing that people long ago used it for manufacturing. The ancients valued amber highly, both as ornament and charm, amber necklaces being worn in the belief that the wearer would thereby be protected from witches, poisons and other evil.

**Ambrose, Saint,** one of the most prominent of the bishops of the early Christian church. He was born in Gaul about 340 A. D., and was educated for the profession of law. He was appointed prefect of Liguria and Æmilia, and chose Milan as his residence. When the bishop of Milan died in 374, there was a great struggle between the orthodox and the Arian Christians in regard to the succession. Finally, Ambrose was unanimously elected, although he was not a priest. He accepted the office reluctantly, disposed of his property, and at once devoted himself to those studies which would prepare him for his office. His life was one of struggle as he opposed those in Rome, who wished to restore the worship of heathen gods, also the Arian sect which denied the divinity of Christ; and he even went on embassies to the northern tribes, which were planning to attack Italy. When the emperor, Theodosius, ordered the massacre of the Thessalonians in 390, Ambrose compelled him to perform penance for eight months, and exacted the promise that thereafter a period of thirty days should intervene before any sentence of death was executed. Ambrose left a large number of writings whose object was to defend and extend the Christian religion. It was through his preaching that Augustine was converted. He was the author of a kind of singing called the Ambrosian chant. He died in 397.

**Am'bulance,** a name applied to the covered wagons used in our large cities to convey the wounded and sick to the hospitals. Strictly, it means a movable hospital attached to an army in the field, to afford early help to the wounded in battle. It was introduced by the surgeon Larrey, into the French army in 1792. Before that, wounded soldiers were either carried to the rear by their comrades, or left uncared for, sometimes until a day after the battle. The usual working of an ambulance during a battle is as follows: The field station is usually just in rear of the troops, and therefore under fire; the wounded are there treated hastily, then carried on stretchers to the transfer station, which is out of rifle range. Here they are put into ambulance wagons and driven to the dressing station, out of artillery range, where the wounds are dressed, and the sufferers are finally taken to the field-hospital.

AMENTUM
(Willow. male and female, with separate flowers.)

**Am'ent.** The characteristic flower cluster of birches, alders, willows, etc. See INFLORESCENCE.

**America** (*a-mer'i-ka*). One of the five continents of the globe, has an area of 16,000,000 square miles, and is larger than Europe and Africa together. Its extreme length from the northern limit of Alaska to the south end of Patagonia is 8,700 miles, or, including the Arctic Islands on the north and Tierra del Fuego on the south, 9,600 miles. Its greatest width is over 3,000 miles. The isthmus of Panama, but twenty-eight miles wide at its narrowest point, separates the continent into North America and South America, and each of these is known as a continent.

These two continents are similar in physical characteristics. Each is a triangle, broadest at the north, and the trend of the western coast of each is directly southeast. Each has a vast mountain range on the western coast, a lower and less continuous range in the eastern section, with a wide central region of plains. Each is drained by three great river systems.

NORTH AMERICA is larger than South America, having an area of 8,700,000 square miles. On the northeast is Hudson Bay, and on the eastern coast are the Gulf of Saint Lawrence, the Bay of Fundy, Delaware and Chesapeake Bays, the Gulf of Mexico and the Gulf of Honduras, with other smaller indentations, affording ample and safe harbors. The western coast has few inlets, the most important being San Francisco Bay, Puget Sound and the Gulf of California.

*Surface and Drainage.* On the western side is the great Rocky Mountain range, running the whole length of the continent. Besides the main Rocky Mountain range, called Sierra Madre in Mexico, are parallel ridges, the Coast, Sierra Nevada and Cascade ranges. This vast system of mountain ranges and

ARCTIC OCEAN
PACIFIC OCEAN
ATLANTIC OCEAN
ASIA
ALASKA
BERING SEA
BERING STRAIT
BEAUFORT SEA
GULF OF ALASKA
DOMINION OF CANADA
GREENLAND
ICELAND
DENMARK STRAIT
BAFFIN BAY
HUDSON BAY
Hudson Strait
LABRADOR
NEWFOUNDLAND
St. JOHNS
Cape Race
Cape Farewell
Julianehaab
Godthab
Disco I.
Cape Hewett
Melville Bay
C. York
Cape Walsingham
C. Mercy
Cumberland Gulf
Frobisher Bay
RESOLUTION I.
Cape Chidley
Ungava Bay
Payne L.
Mosquito Bay
C. Wolstenholme
Fox Channel
FOX LAND
SOUTHAMPTON I.
COATS I.
MANSEL I.
Wager Inlet
Chesterfield Inlet
Baker Lake
Yathkyed Lake
Repulse Bay
Roes Welcome
Melville Peninsula
Gulf of Boothia
Boothia Pen.
Magnetic Pole
King William I.
Victoria Strait
VICTORIA ISLAND
BANKS ISLAND
Melville Sound
Barrow Str.
Lancaster Sd.
DEVON ISLAND
Cornwallis Land
Grinnell Land
Jones Sd.
Kane Basin
ELLESMERE LAND
Grant Land
Hall Land
Lincoln Sea
C. Bridgman
Crocker Land
Crown Prince Gustav Land
Heiberg I.
Sverdrup Is.
Ellef Ringness I.
Prince Patrick I.
Parry Is.
Melville I.
Mc Clure (Banks) Strait
Prince of Wales Strait
Franklin Bay
Prince Albert Sd.
Wollaston Land
Dolphin and Union Str.
Coronation Gulf
Great Bear Lake
ARCTIC CIRCLE
Great Slave Lake
Aylmer L.
Fort Rae
Backs
Clinton Colden L.
Dubawnt L.
Lake Athabasca
Fort Chipewyan
Wollaston L.
Cree L.
Reindeer Lake
Buffalo L.
Churchill R.
Fort Churchill
Cape Churchill
Port Nelson
S. Indian
York Factory
Nelson R.
Severn R.
C. Henrietta Maria
Cape Jones
James Bay
Equan R.
Attawapiskat R.
Albany R.
Eastmain R.
Rupert R.
Lake Mistassini
Gr. White R.
Clearwater L.
Seal L.
Koksoak R.
Hopedale
Nain
Hamilton R.
Lake Melville
Hamilton Inlet
Cape Bauld
White Bay
Notre Dame Bay
Strait of Belle Isle
Gulf of St. Lawrence
Anticosti I.
Mingan I.
Seven Islands
Quebec
Three Rivers
Montreal
Ottawa R.
St. Lawrence R.
Gaspe Bay
Cape Gaspe
Cape Rosier
Bic I.
Rimouski
Father Point
Cape Chatte
Cape Ray
Sydney
Cape Breton (PR.)
Prince Edward I.
Charlottetown
Pictou
Halifax
Cape Sable
Sable I.
Yarmouth
Bay of Fundy
Mt. Desert
Bangor
Augusta
Portland
Boston
Cape Cod
Albany
Buffalo
Lake Ontario
Lake Erie
Lake Huron
Lake Michigan
Lake Superior
Lake of the Woods
Lake Winnipeg
Winnipegosis L.
Manitoba L.
Lake Nipigon
Nipigon
Heron Bay
Port Arthur
Abitibi
Moose R.
Albany R.
Attawapiskat R.
Kenogami R.
Missinaibi L.
Mattagami R.
Abitibi R.
Gr. Nipissing
Nipissing
Mattawa
Pembroke
Kingston
Toronto
Hamilton
Niagara
Niagara Falls
Rochester
Syracuse
Utica
Albany
Troy
Schenectady
Saratoga
Lake Champlain
Burlington
Montpelier
Concord
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Seven Islands
Quebec
Three Rivers
Montreal
Ottawa R.
St. Lawrence R.
Gaspe Bay
Cape Gaspe
Cape Rosier
Bic I.
Rimouski
Father Point
Cape Chatte

NORTH AMERICA
SCALES
Statute Miles, 505 = 1 Inch.
0 50 100 200 300 400 500 600 700 800 900 1000
Kilometres, 812 = 1 Inch.
0 100 200 400 600 800 1000 1200 1400
Rand McNally's New 11x14 Map of North America.
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Longitude West from Greenwich
120° 110° 100° 90° 80° 70°
30° 20° 10° 0°
UNITED STATES
MEXICO
GULF OF MEXICO
CARIBBEAN SEA
ATLANTIC OCEAN
PACIFIC OCEAN
CENTRAL AMERICA
GREATER ANTILLES
LESSER ANTILLES
WEST INDIES
BAHAMA ISLANDS
SOUTH AMERICA
VENEZUELA
COLOMBIA
TROPIC OF CANCER
EQUATOR
Bermuda Is. (Br.)
Cape Hatteras
Cape Lookout
Cape Fear
Cape Canaveral
Cape Sable
Key West
Florida Keys
Straits of Florida
Tampa Bay
Miami
Havana
Matanzas
Cienfuegos
Isle of Pines
Cape Catoche
Yucatan Channel
Campeche
Bay of Campeche
Gulf of Honduras
Belize
Guatemala
Honduras
Nicaragua
Costa Rica
Panama
Gulf of Panama
Gulf of Darien
Kingston
Jamaica (Br.)
Port-au-Prince
Haiti
Santo Domingo
Dominican Republic
Puerto Rico
Virgin Is. (Br.)
Virgin Is. (U.S.)
Guadeloupe (Fr.)
Martinique (Fr.)
Barbados (Br.)
Trinidad (Br.)
Tobago (Br.)
Curacao
Caracas
Maracaibo
Barranquilla
Puerto Cabello
Bogota
Cape Corrientes
Buenaventura
Cape S. Francisco
Panama Canal
Gulf of Mexico
Mississippi R.
Rio Grande
Colorado R.
Lower California
Guadalupe I.
Socorro I.
Revilla Gigedo Is.
Tres Marias
Angel de la Guarda I.
Cedros
Point Eugenia
San Miguel I.
Santa Rosa I.
San Nicholas I.
Point Conception
San Luis Obispo
Santa Cruz
San Jose
San Francisco
Oakland
Mt. Whitney 14,502
Grand Canyon
Death Valley
Los Angeles
San Diego
Salton Sea
Colorado Desert
Mojave Desert
Great Basin
Staked Plain
Llano Estacado
Red R.
Arkansas R.
Missouri R.
Ohio R.
Mississippi R.
Delta of the Mississippi
Gulf Stream
Lake Okeechobee
Lake Michigan
Lake Superior
Lake Erie
Lake Ontario
Lake Maracaibo
Orinoco River
Magdalena R.
Gulf of Venezuela
Gulf of Maracaibo
Gulf of Paria
Gulf of Dulce
Corsa I.
Mariato Pt.
Gulf of Tehuantepec
Gulf of Fonseca
Gulf of Nicoya
Gulf of Guayaquil
Gulf of Panama
Gulf of Darien
Mosquito Gulf
Isthmus of Panama
Panama Canal
Lake Nicaragua
Lake Managua
Lake Izabal
Lake Petén
Lake Atitlan
Lake Amatitlan
Lake Ilopango
Lake Yojoa
Lake Enriquillo
Lake Azuero
Lake Titicaca
Lake Poopo
Lake Nahuel Huapi
Lake Buenos Aires
Lake Viedma
Lake Argentino
Lake Fagnano
Lake Titicaca
Lake Poopo
Lake Nahuel Huapi
Lake Buenos Aires
Lake Viedma
Lake Argentino
Lake Fagnano

## NORTH AMERICAN ANIMALS

BY PERMISSION F. E. COMPTON & CO.

1—Raccoon. 2—Porcupine. 3—Rocky Mountain Sheep. 4—Mountain Goat. 5—Antelope. 6—Bison. 7—Prairie Dog. 8—Grizzly Bear. 9—Skunk.
10—Bald Eagle. 11—Mocking Bird. 12 Blue Bird. 13—Kolibri. 14—Wild Turkey. 15—Prairie Chicken
18—Horned Toad. 20—Axolote, Mexican Salamander.

high plateaus has an extreme breadth of 1,000 miles. Between the main range and the Sierra Nevadas, lies a high table land called the Great Basin, which includes Utah, Nevada and parts of Arizona and New Mexico. The highest peaks are, in Alaska, Mount McKinley, 20,464 feet, Mount Saint Elias, 18,024 feet, Mount Wrangell, 17,524 feet; in the Sierra Nevada range, Mount Whitney, 14,898 feet; in the Cascade range, Mount Shasta 14,510 feet, Mount Rainer or Tacoma, 14,526 feet; in Mexico, Orizaba, 18,250 feet, and Popocatapetl, 17,520 feet.

On the east coast is the Appalachian range, which is lower than the Rockies and runs parallel to the Atlantic, but further from the coast line. Appearing first in the Wotcish ridge of Labrador, it extends to the table lands of Alabama. The White Mountains, Adirondacks, Allegheny and Blue Ridge Ranges belong to this system. Mount Mitchell in North Carolina, 6,688 feet, and Mount Washington, in New Hampshire, 6,293 feet, are the highest peaks.

Between these two mountain systems is the great central plain, stretching from the Arctic Sea to the Gulf of Mexico. The eastern and southern portions of this great plain are, or originally were, heavily timbered. The central portion on both sides of the Mississippi and stretching west to the higher planes of the Rocky Mountain system is the great prairie country, level or slightly rolling, nearly treeless, with a deep and wonderfully fertile soil. East of the Appalachian range is a region of hills and valleys, known as the Piedmont region, sloping down to a wide coastal plain, with low, swampy lands on some portions of the coast. On the Pacific Coast is a narrower but rich and productive region, rising to the western slopes of the mountains, and running through California, Oregon and Washington up into British Columbia.

The southern end of the continent through Mexico is chiefly a great tableland, reaching an elevation of 8,000 feet, dropping abruptly on the east to the Gulf of Mexico, and sloping more gradually to the Pacific. A low level is reached at the Isthmus of Tehuantepec. The greater part of Central America, including Guatemala, Honduras, Salvador and northern Nicaragua, is mountainous, sinking in southern Nicaragua to 100 feet above sea level, where is Lake Nicaragua.

*Animal and Vegetable Life.* The animals of North America possess hardly a feature in common with those of South America. In many respects they stand closely related to those of northern Asia. Among distinctly North American animals are the alligator, bison or buffalo, beaver, Eskimo dog, grizzly bear, moose, muskox, puma or panther, rattlesnake, reindeer and white mountain-goat. There are also black, brown and polar bears, deer, the wolf, fox, raccoon, opossum, prairie dog, otter, marten, lynx badger, and many other animals, which are similar to those of Europe and Asia.

Of birds and wild fowl more than 2,000 varieties have been catalogued. Among the larger kinds are the eagle, vulture, turkey buzzard, hawk, crow, wild turkey, heron, flamingo crane, wild goose, crane and pelican.

Specific trees include the boxwood, cypress, hickory, magnolia, mahogany, palmetto, pecan, redwood, sequoia. There are also vast forests of pine, spruce, fir, hemlock, cedar, as well as oak, ash, maple and many other varieties of hard wood. Of plants and vegetables, cotton, cactus, maize, orchids, peppers, pineapples, plaintains, potatoes, sugarcane and yams are natives of America, and here are the great grain fields of the world.

*Climate.* Stretching as it does from the arctic to the tropical zone, North America presents every variety of climate. In the extreme north the ground remains frozen through the year, the short summer sufficing to warm the surface and produce a meager vegetation. The temperate region is subject to wide ranges of temperature, giving four seasons, a frigid winter, mild spring and autumn and a hot summer, while the southern portion presents the usual characteristics of the tropics. Moreover, the temperature on the Atlantic coast and the interior is more variable than on the Pacific coast, where the climate is modified and made equable by the warm winds from the Pacific. The climate of the western coast is more like that of the western coast of Europe.

The rainfall is heaviest on the Gulf coast and lower Mississippi Valley, where the south winds bring in the moisture-laden air from the Gulf; and on the more Northern Pacific coast, where the prevailing winds are from the ocean. On the Atlantic and westward to the upper Mississippi Valley and north of the great lakes, the rainfall is ample for vegetation, while east of the Rocky Mountains, remote from the Gulf, and on the lower Pacific coast, there are large semi-arid areas.

*Minerals.* North America is rich in minerals. Immense deposits of gold, silver and copper are found in the Rocky Mountain range, from Alaska, through Mexico, and rich but less extensive fields in other parts of the continent. North America stands first of the continents in the production of silver, and second and nearly equal to Africa in the production of gold. The United States alone, in 1906, produced more than one third of the world's coal, more than half the world's copper and almost one half the world's iron. Excepting tin, all the important minerals are found in abundance.

*Inhabitants.* When America was discovered by Europeans it was peopled by a savage race, who were named Indians because the land was then supposed to be a part of India. In the north these were roving tribes, living chiefly by hunting and fishing. In Mexico were found the Aztecs, who had been preceded by the Toltecs, and these were more civilized than the tribes of the north. These people receded before the advance of the white race, and are now few in number and confined to circumscribed limits or reservations. The early emigrants to America were chiefly English, who settled in the United States, French, who entered Canada, and Spanish, who occupied Mexico and Central America. The present population is made up of descendants of these colonists and of later emigrants from every European nation and some from Asia, together with Negroes, who were introduced as slaves.

*Divisions.* The political divisions of North America are the United States, the Dominion of Canada, Newfoundland, Mexico and the Central American States. Canada occupies almost the whole of the continent north of the great lakes and lat. 49° N. The territory of the United States extends from the British possessions to Mexico and the Gulf of Mexico and from the Atlantic to the Pacific Ocean. Alaska Territory, belonging to the United States, occupies the northwest corner of the continent. The republican form of government prevails everywhere, except in the British dominions. The areas and population are as follows:

| | Area, sq. miles | Pop. |
|---|---|---|
| British America (including Newfoundland) | 3,729,665 | 7,319,400 |
| United States (including Alaska) | 3,617,673 | 92,036,622 |
| Mexico | 767,005 | 15,063,207 |
| Central American States | 207,474 | 4,803,487 |
| West Indies | 94,400 | 6,451,237 |
| | 8,416,217 | 125,673,953 |

*History.* The history of America begins in 1492, when Christopher Columbus sighted the West Indies, probably Watling's island, in the Bahamas. We know that 500 years before Columbus there were Norse colonies in Greenland and on the continent further south, which were altogether forgotten at the beginning of the 16th century. The belief that the natives of the continent came from China is gaining some credence, though little definitely is really known. However, it is generally held that the native peoples of the two Americas alike are all of one race. The natives were called Indians, as the continent was supposed to be a part of Asia. It was named in honor of Amerigo Vespucci, a Florentine, who first sailed for the western hemisphere, in 1499.

For modern history of North America, its material development and civic progress, see articles on UNITED STATES, CANADA and MEXICO; also articles on the different states and provinces.

CENTRAL AMERICA. The southern end of North America, lying between Mexico, Colombia, the Caribbean Sea and the Pacific. In geological formation, it differs from North and South America, and appears to belong to a different system, related to the West Indies, the mountain folds having an east and west trend, and apparently having no connection or relation to the Rocky Mountain and Andean systems of North and South America. Its length is 1,280 miles and maximum breadth 315 miles, dwindling to 28 miles at the Isthmus of Panama. The area is 207,474 square miles, and the population about 4,803,487, Panama included.

*Physical Features.* At Tehuantepec, Mex., is a broad plain. In northern Guatemala the mountains begin, close to the Pacific, extending through Salvador, Honduras and Nicaragua. Not of great height, they consist of detached ranges with volcanic peaks, some of which are active. Then comes the depression nearly filled by Lake Nicaragua, the largest inland body of water south of the great lakes. In Costa Rica highlands follow. Panama is a low plateau. The rivers flow mostly into the Gulf and the Caribbean. The climate is tropic and pestilential on the shores and along the streams, but moderate and healthful on the uplands. The rainfall is enormous, 200 inches at Panama, and creates heavy vegetation.

*Animal and Vegetable Life.* The animals of Central America are those of South America. There are heavy forests which are rich in mahogany and other valuable woods. The chief products are fruits, coffee, rubber, sugar, indigo and tobacco; corn, wheat and rice are grown to some extent. Mineral resources are great, including gold, silver, platinum, copper, lead, iron and zinc.

*Inhabitants.* Central America was the home of the Aztecs, and is rich in remains of this ancient civilization. The present inhabitants are Creoles or Spanish-speaking whites, Indians, Negroes and mixed races.

*Political Divisions.* These include Belize (British Honduras), Costa Rica, Guatemala, Honduras, Nicaragua, Panama and Salvador. Belize is a British possession, the remaining states independent republics.

*History.* The coast of Central America was visited by Rodrigo de Bastidas in 1500, and by Columbus in 1502. It was invaded by Cortez in 1524. Guatemala and Salvador were held by Alvarado, second in command to Cortez. For three centuries the country was under Spanish rule and subject to frequent disturbances and harsh conditions. Independence was achieved in 1821, and in 1823 a republic was formed by the union of the five provinces. Slavery was abolished in 1824, but after dissensions and

NATIVES OF NORTH AMERICA

1 Eskimo of Labrador 2 Eskimo Woman of Greenland 3 Apache 4 Navaho 5 Koskimo Woman, Vancouver 6 Cheyenne 7 Mandan 8 Ute 9 Blackfoot 10 Woman Moki Chief 11 Nez Perce 12 Wichita Woman

NATIVES OF SOUTH AMERICA

1 Guatuso 2 Talamanoan Woman 3 Bolivian Indian 4 Guaykuru 5 Caraja 6 Matako
7 Brazilian Indian 8 Guayaqui 9 Araucanian (Chile) 10 Tierra del Fuegan
11 Patagonian 12 Botocudo Woman

CARIBBEAN SEA
LESSER ANTILLES
ATLANTIC OCEAN
PACIFIC OCEAN
HONDURAS
TEGUCIGALPA
NICARAGUA
MANAGUA
L. Nicaragua
COSTA RICA
SAN JOSE
PANAMA
Gulf of Panama
Gulf of Darien
Panama
Mosquito Gulf
Porto Bello
Chagres R.
Pt. Gallinas
Gulf of Venezuela
Maracaibo
L. Maracaibo
Puerto Cabello
Valencia
La Guaira
Caracas
Barcelona
Cumana
Carupano
Paria
Martinique (Fr.)
St. Lucia (Br.)
St. Vincent (Br.)
Barbados (Br.)
Curaçao (Dutch)
Bonaire I.
Aruba
Margarita I.
Tortuga I.
Tobago (Br.)
Port of Spain
Trinidad (Br.)
Orinoco Delta
Orinoco R.
Barrancas
Ciudad Bolivar
Maracaibo
Barquisimeto
Merida
Pamplona
Bucaramanga
Medellin
Socorro
Chiquinquira
Soata
Tunja
Sonson
Manizales
Ibague
Buenaventura
Bahia del Choco
Cali
Palmira
Popayan
Neiva
Quilichao
Pasto
Tumaco
Esmeraldas
Punta Galera
Punta Manglares
Malpelo I.
Cape San Lorenzo
Punta Reyes
Guayaquil
Punta Sta. Elena
Gulf of Guayaquil
Tumbez
Cape Blanco
Punta Parina
Paita
Piura
Sechura B.
Punta Aguja
Lambayeque
Eten
Pascamayo
Truillo
Chimbote
Casma
Huaraz
Huamuco
Cerro de Pasco
Huanuco
Huacho
Callao
LIMA
Huancavelica
Cañete
Ayacucho
Pisco Bay
Chincha Islands
Pisco
Cuzco
Punta Panta Maria
Cape Nasca
San Juan Bautista
Arequipa
Chala
Camana
Mollendo
Pacocha
Tacna
Iquitos
Loreto
Nauta
Pebas
Yurimaguas
Moyobamba
Chachapoyas
Chota
Chiclayo
Pacbiza
Cajamarca
Pacasmayo
Huanchaco
Huaura
Canta
Huacho
Tarma
Jauja
Huancayo
Ocros
Santa Ana
Paucartambo
Sicuani
Urcos
Juliaca
Puno
Chuquibamba
Pausa
Santa Rosa
Callauna
Sandia
Cuyo-Cuyo
Lampa
Azangaro
Ayaviri
Santa Ana
Exaltacion
Reyes
Trinidad
San Javier
Concepcion
Mojos
Loreto
Baures R.
Guaporé R.
Rio Madre de Dios
Rio Beni
Rio Mamoré
Rio Itenez
Rio Paraguay
Rio Jauru
Rio Tapajos
Rio Arinos
Rio Juruena
Rio Tapirapé
Rio Xingu
Rio Iriri
Rio Xingu
Rio Fresco
Rio Jamanxim
Rio Tocantins
Rio Araguaya
Rio Grande
Rio Paranahyba
Rio Parnahyba
Rio Gurupy
Rio Turyassu
Rio Pindaré
Rio Mearim
Rio Itapicurú
Rio Real
Rio Vasa Barris
Rio Sergipe
Rio Paraguassu
Rio Jequitinhonha
Rio Pardo
Rio Mucury
Rio Doce
Rio Grande
Rio Francisco
Rio Verde
Rio Preto
Rio Pardo
Rio Jequitinhonha

SOUTH AMERICA
SCALES
Statute Miles, 405 = 1 Inch.
0 100 200 300 400 500 600
Kilometres, 652 = 1 Inch.
0 100 200 300 400 500 600 700 800 900 1000
Rand McNally's New 11 x 14 Map of South America.
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PACIFIC OCEAN
ATLANTIC OCEAN
ARGENTINE REPUBLIC
CHILE
PARAGUAY
URUGUAY
BRAZIL
BOLIVIA
PERU
TROPIC OF CAPRICORN
Longitude West from Greenwich
Buenos Aires
Montevideo
Asuncion
Santiago
Valparaiso
La Paz
Lima
Rio de Janeiro
Sao Paulo
Curitiba
Santos
Cabo Frio
Falkland Is. (Br.)
South Georgia (Br.)
Shag Rocks
Tierra del Fuego
Strait of Magellan
Gulf of San Matias
Bay of San Jorge
Gulf of Peñas
Bahia Blanca
Puerto Deseado
Puerto San Julian
Puerto Gallegos
Rio de la Plata
Rio Colorado
Rio Negro
Rio Chubut
Rio Deseado
Rio Santa Cruz
Rio Parana
Rio Paraguay
Rio Uruguay
Rio Grande do Sul
Lagoa dos Patos
Lagoa Mirim
Aconcagua 22,835
Tupungato (Dorado) 21,490
Tronador 10,385
Corcovado Vol. 7,400
Nevado de Cachi 21,300
Gona Inez 18,250
Nevado de Famatina 20,000
Cerro del Cobre 15,300
Juan Fernandez Is. (To Chile)

civil war the republic was dissolved in 1838. The progress of the country has since been retarded by frequent wars and revolutions. In 1907 a meeting of delegates from all the states was held in Washington, U. S. A., and an agreement was made that all differences which may occur shall be submitted to a peace-court at Costa Rica.

South America. It is important to remember that South America is southeast of North America. The entire southern continent lies east of Florida, and three-fourths of its western coast lies east of New York. Its easternmost point is nearer to Africa than is its northern coast to New Orleans. Its length is 4,500 miles, greatest breadth 3,200 miles, area 7,300,000 square miles and population about 40,000,000. It is a triangle with its base on the north, and dwindling to a point at Cape Horn on the south. Its coast-line is for the most part unbroken, the important inlets being on the north the Gulf of Venezuela, on the northeast the mouth of the Amazon, on the east the Bay of All Saints, Bay of Rio de Janeiro, the mouth of the Plata, Bahia Blanca, Gulf of San Matias and Bay of San George; on the west line there is no important break in the coast-line, but several small bays which afford harbors.

*Surface and Drainage.* A commanding physical feature of the continent is the mighty Andean Mountain range which traverses its entire length on the western coast, with a mean height of 12,000 feet, a breadth varying from 40 to over 300 miles, covering more than one million square miles, numbering scores of active volcanoes, and towering at Mt. Aconcagua to 24,000 feet, the highest point on the western hemisphere. In the heart of the continent it divides into two ranges, inclosing the high plateau of Bolivia, the second largest and most elevated table land in the world, with an elevation of 13,000 feet and an area of more than 40,000 square miles. This tremendous mountain wall dominates the rainfall and largely influences the climate and the productive value of almost the entire area of the continent. Lower lateral ranges run through Venezuela and the Guianas, and in eastern Brazil are several parallel ranges with intervening highlands.

Within these bordering mountain ranges the center of the continent is a vast region of plains and valleys, sloping up to the Andes and stretching down through the rich pampas of Argentina to the gravelly plains of Patagonia.

The continent is drained by three vast river systems, the Amazon, the Orinoco and the Plata. As drainage systems and navigable water-ways they have no parallel, affording over 50,000 miles of navigable waters. The Amazon discharges more water than Asia's eight largest rivers. In its valley of 2,500,000 sq. miles is a vast, almost impenetrable forest. It is connected with the Orinoco indirectly by a sometimes navigable channel. The Plata system, in its northernmost feeders, lies but three miles from southern tributaries of the Amazon, and a canal would provide unbroken inland navigation from the mouth of the Amazon to the mouth of the Plata. Another, around rapids in the Orinoco, would pass boats from Venezuela to Uruguay. These rivers form nature's highroads from the Atlantic to the Andes. The great lake is Titicaca in Bolivia, 12,645 feet above tidewater and about 1,800 miles in area.

*Climate and Rainfall.* South America experiences less variation in temperature than North America. Three fourths of its area, including the most fertile districts, lie within the tropics, about one fourth in the temperate zone. The tropic regions east of the Andes receive heavy rains in the long wet season, and have high temperatures, but the western coast between Panama and Chile is a burning desert. The Andes on their sunset slopes make climates of their own, differences in altitudes, even in the tropics, creating warm, temperate and frigid zones.

It is important to note that while in North America the heaviest rainfall is on and near the sea coast, in South America it is heaviest in the interior of the continent, remote from the sea. The trade winds carry the warm moisture-laden air inland from the Atlantic, until, cooled by contact with the foot-hills of the Andes, heavy precipitation occurs, and, passing on, the remaining vapor falls in snow on the summits of the range, the winds falling on the western slope cool and dry. Thus the western coast-line north of latitude 30° is practically rainless, there being points where no rain has fallen for many years, while on the eastern slopes of the Andes the rains are tremendous. The rivers of the western coast are small shallow streams, while east of the Andes the rivers become streams of great volume near their source, and furnish commercial highways thousands of miles inland from the sea.

*Animal and Vegetable Life.* The variations in elevation and rainfall result in a wide range of products. In the tropical valleys, under the influence of heat and moisture, vegetation is riotously luxuriant. Forests, especially in the Amazon valley, are so dense as to be almost impenetrable. A scientist who camped in this region relates that he found it necessary to have the area about his hut cut over at frequent intervals, to escape being enveloped in the rank, upspringing vegetation. The forests are rich in rubber and ornamental woods, including rosewood, satinwood, cedar and mahogany; besides valuable dye-woods. Corn, potatoes and tobacco are indigenous, as are agave, arrowroot, cinchona, cocoa, pineapple and tapioca. The forests teem

with animal life. Four fifths of the mammals and birds are elsewhere unknown. Among them are the jaguar, gigantic boas, blood-sucking bats, the llama, the vicuña, guañaco, the alpaca, the tapir and the condor.

*Resources.* South America is rich in mineral, forest and agricultural resources, yet none of these have been developed so as to give an adequate measure of their possibilities. Gold and silver are exported from nearly all of the republics. The mines of Peru and Bolivia are famous, and those of Brazil, Chile, Colombia and Guiana are important. Large deposits of iron and diamonds are found in Brazil. (See BRAZIL.) The forests have an inexhaustible store of rubber and valuable woods. Brazil furnishes 65% of the world's coffee and more than half the world's rubber; the wheat of Argentina is a large item in the world's commerce.

*Inhabitants.* These belong to the white, red and black races, and include hybrid races. The white inhabitants consist in large part of Spanish and Portuguese Creoles, American descendants of European settlers, though the British, Dutch and French are present. Argentina and Brazil have hundreds of thousands of German, Italian and Polish colonists. The red men or Indians are the aborigines, and the ancestors of some of these originated native civilizations. The blacks are the descendants of slaves imported from Africa, but slavery has nominally ceased. Chinese and Hindu coolies are present in considerable numbers.

*Political Divisions.* South America comprises the republics of Colombia, Ecuador, Venezuela, Peru, Bolivia, Chile, Argentina, Brazil, Paraguay and Uruguay, besides the colonies of British, French and Dutch Guiana and the Falkland Islands (British). The areas and populations are as follows:

| | Area, sq. m. | Pop. |
|---|---|---|
| Argentina | 1,139,979 | 6,989,023 |
| Bolivia | 708,195 | 2,267,935 |
| Brazil | 3,218,130 | 20,515,000 |
| Chile | 291,500 | 3,500,000 |
| Columbia | 438,436 | 5,072,604 |
| Ecuador | 116,000 | 1,500,000 |
| Paraguay | 171,815 | 800,000 |
| Peru | 679,600 | 4,500,000 |
| Uruguay | 72,210 | 1,042,686 |
| Venezuela | 393,976 | 2,713,703 |
| British Guiana | 90,277 | 296,041 |
| French Guiana | 30,500 | 27,000 |
| Dutch Guiana | 46,258 | 85,094 |
| Falkland Islands | 5,300 | 2,272 |
| | 7,402,176 | 49,311,358 |

*History.* The history of the continent falls into two eras—that before and that since Columbus discovered South America (1498). The Peruvian or Inca Indians had advanced far in culture and empire-building, but Pizarro (1531) conquered and destroyed their civilization. The history during the sixteenth century is a record of exploration and invasion. As early as 1550 the contour of the continent was determined, the country penetrated to the core and European power established. Spanish activity included far the greater part of the habitable area, Portuguese colonization confining itself to Brazil. Portugal and Spain for three centuries failed to treat their possessions sagaciously or generously, exploiting the colonists as badly as the natives and the resources. Between 1605 and 1767 the Jesuits civilized the Indians of Paraguay. During 1776-1811 colonial loyalty to Spain was everywhere weakened. In 1810-25 came the heroic age. Bolivar, San Martin and Sucre' freed Buenos Aires, Chile, New Granada (now Colombia), Quito (now Ecuador), Paraguay and Peru, while Brazil became independent peacefully. Monroe, in 1823, enunciated the doctrine that Europe should in no way attempt to control the destiny of South America. During 1825-75 the Spanish Americans suffered greatly, the Brazilians slightly, from civil and foreign wars, but about 1877 an era of progress opened. Our Centennial and Columbian Expositions fostered aspirations for peace and prosperity. Secretary Blaine, President Cleveland and Secretary Root strengthened political friendship between Latin America and the United States — the first (1881 and 1889) by Pan-American congresses, the second (1896) by forcing Britain to arbitrate the Guiana disagreement with Venezuela, the third (1907) by visiting the southern republics. They participated honorably in the Hague peace-conferences of 1899 and 1907. Argentina, Brazil and Chile have progressed materially.

The Panama canal, which Saavedra suggested in 1520, will immeasurably benefit South American as well as North American countries.*

**America,** the popular name of the tune to which the words "My Country, 'Tis of Thee" are commonly sung. The national song of England, "God Save the King," is adapted to the same music. We also find it in use in Denmark, Switzerland, Germany and other countries as a national song. Its origin has been ascribed to Lully, to the Scotch, to Purcell, to Dr. Arne, to Henry Carey and to Dr. John Bull. The words, "My Country, 'Tis of Thee," were written by Rev. Dr. Samuel F. Smith, and first used at a children's celebration in Park Street Church, in Boston, July 4, 1832. (See GOD SAVE THE KING.)

**America Cup, The,** is a trophy offered for the first time at the London international exhibition of 1851 by the Royal Yacht Squadron; and now held subject to annual challenges by the New York Yacht Club. Its name is due to the fact that the cup was won in 1851 by the U.-S.-built yacht, *America.* The yacht *America* was the first vessel to be built upon anything like modern

*"Our southern neighbors in this Hemisphere," says Director General Barrett of the Pan American Union, "will enjoy, because of the opening of the Panama canal, the greatest material, commercial, and economic development which any group of nations has ever experienced in the history of the world."

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## SOUTH AMERICAN ANIMALS

1—Vampire Bat. 2—Howling Monkey. 3—Aracari. 4—Condor. 5—Opossum. 6—Toucan. 7—Pampas Deer. 8—Tangars. 9—Tufted Humming Bird
10—Llama. 11—Peccary. 12—Agouti. 13—Guinea Pig. 14—Ant Bear. 15—Rhea. 16—Jaguar. 17—Diamond Snake. 18—Pitted Frog.
19—Swimming Marsupial. 20—Armadillo. 21—Pampas Chicken. 22—Scaly Salamander.

racing lines and to have a long bow and flat sails. Ever since the victory of the *America*, the cup has exercised a great influence upon yacht-builders. The deep, narrow knife-blade hull was popular until 1891, when the *Gloriana* won all her races, and showed the advantage of "overhangs." While American builders have aimed chiefly at racers, British builders have tried to combine the racer with the cruiser, but it would seem that the easy defeat of Sir Thomas Lipton's challenger *Shamrock III* by the *Reliance*, in 1903, shows that no vessel fitted for cruising is fitted for racing also.

**American Indians.** See INDIANS.

**American Institution,** an institution founded at Washington, D. C., in 1891, with the design of providing advanced instruction for graduates of other colleges, and subsequently placed under the auspices of the Methodist Episcopal Church, with John F, Hurst, D. D., LL. D., as its first chancellor. Its working organization is as yet hardly planned out, though its purposed scope is large and important as a post graduate university and of coeducational character.

**American Lion.** See PUMA.

**American Literature.** See LITERATURE.

**American School at Athens, The.** The American School of Classical Literature, Art and Antiquities, in Athens, was founded in 1881 at the suggestion of Professor Charles Eliot Norton. It is supported partly by endowment and partly by contributions from American colleges and universities. It affords opportunities for advanced study of ancient Greek civilization, and carries on archæological investigations. It has made important excavations in Argos, Crete and other places. The results of the studies and excavations are reported in the *American Journal of Archæology*.

**American School in Rome.** This school was founded in 1895 by the Archæological Institute of America, and is supported by a number of American colleges and universities and by private gifts. In 1906, it had an endowment fund of nearly $100,000. The school is under the immediate superintendence of a resident professor, the director, who is assisted by a faculty of four specialists. The object of the school is "to promote the study of classical literature in its bearing upon antiquities and history; of classical, Etruscan and Italic art and archæology, including topography, palæography and epigraphy; and of the art and archæology of the early Christian, the mediæval, and the renaissance periods within the boundaries of Italy." The school year extends from October to July. Part of this time is usually spent in study in Greece.

**American University,** founded in 1893 at Harriman, Tenn., under the denominational auspices of the Christian Church. Its president was James A. Tate, M. C., and it had a teaching faculty of 12 professors, with a student attendance, in 1906 of 317. It had a small library of about 2,500 volumes. It has since been discontinued.

**Amer'icus Vespu'cius** or **Amerigo Vespucci** (*vĕs-pōōt'chē*) (1451–1512), an Italian navigator, who in the era of Columbus, about the close of the fifteenth century, made several voyages to the northern coast of South America, and, it is alleged, made one voyage to North America, sailing along the coast of Florida as far north as Chesapeake Bay. There is doubt cast upon some of these voyages, though it is said that at least one of them was made in company with Columbus, while Vespucius wrote and published in his day narratives of all of them. What at least is certain is that the newfound continent came to bear the Florentine navigator's name, though this was not by his own seeking nor from any wish on Vespucius's part to detract from the honor due to Columbus in naming the New World America. What otherwise is known of Vespucius is that he was for a time in the commercial office of the Medici in Florence, and later on became a merchant at Seville, whose business it was to furnish supplies and to fit out vessels engaged in foreign trade. See Fiske's *Discovery of America*, Thatcher's *Continent of America* and Harrisse's *Discovery of North America*.

**Ames** (*āmz*), **Fisher** (born 1758, died 1808), an American orator, statesman and political writer. He graduated at Harvard College at the age of 16, and after a few years entered the law. At the same time his essays in the Boston newspapers under the names "Camillus" and "Brutus," made him well known. He was a member of the Massachusetts convention which ratified the Constitution in 1788, and was the first representative in Congress from his district, which then included Boston. He was especially famous for his energy and eloquence in debate.

**Amesbury** (*āmz'bĕr ĭ*), **Mass.,** a town in Essex County, on the Merrimac River, 27 miles from Salem and 45 from Boston. It has manufactories of cotton and woolen goods, machinery, carriages, boots and shoes, hats, etc. From 1836 it was for many years the residence of the poet Whittier. Population, 9,849.

**Am'ethyst** (*ăm'ĕthĭst*), a purple variety of rock crystal or quartz. Its name comes from the Greek, meaning "to prevent intoxication," and was given it because of the idea held by the ancients that liquor drunk from a cup made of amethyst would not intoxicate. It is found in Brazil, Ceylon, India and many other places, and is much worn in the form of rings, seals, etc. The oriental amethyst is a variety of the sapphire.

**Amherst** (*ăm'ĕrst*), a town of Massachusetts, about 82 miles west of Boston. It is

known as the seat of Amherst College, a Congregational institution founded in 1821. The original purpose of the college was to educate young men for the ministry. There are now 50 instructors and 502 students, with an art gallery, a library of 52,000 volumes, memorial chapel, gymnasium, observatory and rare museum of Indian relics Nineveh antiquities, minerals and tracks in stone. It has a fine collection of casts from famous statuary, a park of twenty-six acres, with ball and tennis grounds. Near the town is the Massachusetts Agricultural College, considered one of the best agricultural schools in America. Population, 5,112.

AMHERST COLLEGE CHAPEL AND DORMITORIES

**Ami** (*ă'mee*), **Henry M.,** M.A., D.Sc., F.G.S. and F. R. S. of Canada, was born at Belle Riviére, near Montreal, Nov. 23, 1858. He is the son of the late Rev. Marc Ami of Geneva, Switzerland. He was educated in the Ottawa public and grammar schools and at McGill University, where he took high honors, and in 1903 was awarded the Bigsby medal by the Geological society of London, Eng. He has been the paleontologist of the geological survey of Canada since 1882, and is the author of many papers on the paleontology and chronological geology of Canada. His home is in Ottawa, and there he edited the *Naturalist*, from 1895 to 1900.

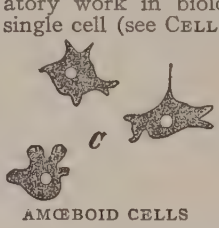
**Amiens** (*ă'mē-ăn'*), a manufacturing city of France, formerly the most important in Picardy. It possesses a venerable and famous cathedral. Population, 93,207. The well-known treaty of Amiens, which ended a war that had lasted ten years, was made by Great Britain with France, Holland and Spain in 1802. England gave up all of its conquests of the war, except Ceylon and Trinidad. France gave up Naples, and Egypt was restored to Turkey. In the Franco-German War, Amiens fell for a time into the hands of the Germans (November 1870), while the latter gained a great victory over the French Army of the Loire.

**Am'men, Daniel,** was born May 15, 1820, in Ohio, and entered the navy as midshipman in 1836. During the Civil War he took part in the battle of Port Royal, and in the attacks on Fort Fisher and Fort Sumter. He became commodore and afterward rear-admiral, retiring in 1878. He died July 11, 1898.

**Am'mon,** an Egyptian god, connected by the Greeks and Romans with Zeus or Jupiter. The Egyptians called him Amen, the hidden god, and in the earliest times represented him as a man, but in later times as a ram or a man with a ram's head. He had famous temples in Thebes, Egypt, and on the oasis of Ammon in the Libyan desert and in many other places.

**Ammo'nia,** a gas ($NH_3$), which is dissolved by water with great avidity, making an alkaline liquid called ammonia-water or, by chemists, ammonium hydroxide, which is the common form in which it is used. The name is probably derived from the temple of Ammon in the Libyan desert, where ammonia was produced. The name hartshorn is also used, because the shavings of horns have been used to prepare it. It is composed of nitrogen and hydrogen, and is obtained chiefly from the waste liquors of the manufactories of illuminating gas. Ammonia gas may be changed to a liquid or solid by cold and pressure. An important use of liquid ammonia is in the manufacture of ice. (See ICE.) Ammonia unites with acids to form ammonium salts. The carbonate is much used for smelling salts, the chloride is used in soldering and in medicine, and the sulphate and other salts are valuable fertilizers.

**Amœ'ba,** one of the lowest microscopic animal organisms, extensively used in laboratory work in biology. The amœba is a single cell (see CELL DOCTRINE); its body is a mass of protoplasm. Therefore, when we make observations upon it we are observing protoplasm at first hand and can determine its properties and behavior. Within its body all the physiological acts take place in a simplified form. It is, therefore, of unusual interest to biologists, for the physiological processes are so complex in higher animals that one must have them reduced to their simplest expression in order to comprehend them. The soft protoplasm of its body is always moving. It flows into finger-like processes (*pseudopodia*), and changes its position from place to place. It also flows about food particles and thereby engulfs them into its substance. The amœba is found in stagnant water, moist moss, etc. The living substance of its body is contractile, like muscles; irritable, like nervous tissue; receptive, assimilative, respiratory, reproductive, etc.—the germs of activities that are more developed and




AMŒBOID CELLS

perfected in higher animals. See PROTOZOA.

**Amoor'** or **Amur,** a river of eastern Asia, 1,800 miles long. It forms a part of the boundary between Siberia and China, and flows into the Sea of Okhotsk. Length of river, including its chief tributary, the Argun, 2,800 miles, of which over 2,000 are navigable. In 1858, Russia had ceded to her the whole of the left bank of the Amur; since then, in taking possession of the Amur Valley, she has occupied much also of the right bank of the river. Amur is also a Russian province in Siberia, area 172,826 square miles; population, 119,909.

**A'mos,** one of the minor Hebrew prophets, lived about 800 B. C. He was a herdsman and a dresser of sycamore trees in the region of Tekoa, a fortified town south of Judah. He vigorously denounced the idolatry of the Jews, and prophesied the anger of God against idolatrous nations. His language is remarkable for its simplicity and clearness.

**Ampère** (*ăñ'pâr'*). The "practical unit" in which electric currents are measured. The numerical value of the ampere, as established by the International Electrical Congress, held at Chicago in 1893, is "*the practical equivalent of the unvarying current which, when passed through a solution of silver nitrate in water, in accordance with standard specifications, deposits silver at the rate of* 0.001118 *grams per second.*"

This definition, having been ratified by Congress, now defines the "legal ampere."

The logical definition of the ampere, and the one which the legal unit approximates as nearly as possible, is "a current equal to one-tenth of the absolute unit of current." See ELECTRICITY.

**Ampère** (*ăn-pêr'*), **Andre-Marie** (born 1775, died 1836). A distinguished French physicist and mathematician. Most of his working life was spent at the *École Polytechnique*, the great military school of Paris.

Ampère's most important contributions to knowledge are, perhaps, the three following:

*First:* His clear analysis and mathematical description of the work of Oersted. It was in the autumn of 1820 that Oersted discovered the effect of an electric current upon a magnetic needle. In less than one week after learning of this discovery, Ampère had extended the results by experiment and had reduced the description to a mathematical formula.

*Second:* The discovery that electric currents produce a magnetic effect upon each other: so that when the currents in two wires are flowing in parallel directions, they attract each other; but, when flowing in opposite directions, repel each other.

*Third:* Ampère introduced the very fruitful hypothesis that magnetic substances are made up of molecules in which electric currents circulate but meet no resistance. These currents are therefore permanent.

According to this view, a body is magnetized when its molecules are made to face more or less one way.

**Amphibia** (*ăm-fĭb'e-a*), a natural class of vertebrate animals including frogs, toads, salamanders, newts, etc. The peculiarity about the amphibia is that they pass through a tadpole state. They are at first adapted to living in the water and breathe by gills and have no legs; but they gradually change; usually the gills disappear, and lungs and legs are developed. They are in a way intermediate between fishes and land animals. Sometimes the gills are retained throughout life, as in the mud-puppy (*Necturus*) and Mexican axolott. These forms have both lungs and gills. The salamanders are like lizards in form but are different in structure and development. Fossil amphibia are found imbedded in the rocks with a body as large as an ox. See FROG, TOAD, SALAMANDER, etc.

**Amphithe'ater.** See COLOSSEUM.

**Am'sterdam** or **Amsteldam,** the capital and largest city of the Netherlands. The city is built on an arm of the Zuyder Zee, in the shape of a half-moon, and as the site is a marsh it is founded on piles driven deep into the mud. Dikes guard it against the tides, which rise higher than the city's level. A system of canals with the river Amstel divides the city into about ninety islands, with nearly 290 bridges; hence the name of the city, Amsterdam, meaning "the dam or dike of the Amstel." There are many fine public buildings, the finest being the palace, built in 1648. There are several public societies, such as the Society of Public Welfare, whose object is to promote education and the improvement of all classes, and which has branches in nearly every town and village of Holland. From a small fishing village in the 13th century, Amsterdam became, by the close of the 17th century, the first commercial city of Europe. After years of decline, it has again risen into commercial prominence. The Amsterdam canal, uniting the city (17 miles distant) with the North Sea, has recently been greatly enlarged and deepened, tidal locks being affixed at either end—the Zuyder Zee end and the North Sea entrance. Population 568,130.

**Amsterdam,** a city of Montgomery County, New York, 33 miles from Albany. It is an important manufacturing city, among its products being pearl buttons, carpets, rugs, knit-goods, wagon-springs, paper, paper-boxes, silks and brooms. Besides, it has foundries and machine shops. Amsterdam is located on the Mohawk River and Erie & Barge Canal, and the West Shore and the New York Central railroads. The first settlement was made in 1778 and was known as Veedersberg until 1804. The present city was incorporated in 1885, and has all the adjuncts

of a progressive city. Population at present is 35,000.

**Amundsen,** (*ä'-mŭnd-sĕn*) **Capt. Roald.** For nine months of the year no stranger comes to the mining camp of Eagle City, Alaska. It is on the Arctic circle, and its one street of log houses fronts on the frozen flood of the Yukon. When, therefore, one short, dark day in December, 1905, a dog-sledge dashed into town over the ice of the river, not from the coast 150 miles to the west, but from the north, down the slope of the Canadian Rockies, everyone was amazed. The stranger was of powerful build and had the sea-blue eyes and blond coloring of a Norse viking. He was clothed in yellow seal-skins, and his dogs were of Esquimaux breed, unlike Alaskan huskies.

"Captain Roald Amundsen of the Sloop Gjoa, Christiania, Norway," is the way in which he registered in the log hotel. It was the Norwegian explorer, whose little ship had been reported crushed in the ice six months before. He had sailed from Greenland to the mouth of the Mackenzie River, through the Northwest Passage that had been sought for very nearly four hundred years—from the time Sebastian Cabot coasted along Labrador, in 1497. He had spent two long years on King William's Land, where Sir John Franklin had perished sixty years before; had determined the position of the north magnetic pole in King William's Land; and had brought his gallant little craft and crew of six men through unharmed.

Roald Amundsen was born of Norwegian parents in the city of Christiania, Norway, in 1872. After completing a common school education he became a sailor. At 25 years of age he joined a south polar expedition. Returning, he sought the friendship of Dr. Nansen, the Arctic explorer, for he had decided to try to locate the magnetic pole and to make the Northwest Passage, both of which Sir John Franklin's expedition had determined to lie in the neighborhood of King William's Land and Boothia. He fitted out a 73 foot, 60 ton sloop to be propelled by a petroleum engine and manned by six Norse sailors. He left Christiania in June, 1903, got dogs and supplies at Godhaven, Greenland, and disappeared. He reached Herschell Island, Mackenzie River, in Oct., 1905. Here he was frozen in, made his way overland to Alaska and returning in the spring took the Gjoa around through Behring Straits to San Francisco.

But Amundsen's crowning achievement was the discovery of the South Pole. He sailed from Norway in Nansen's vessel, the Fram, in 1910. Early in 1911 he reached Whales Bay, where he went into winter quarters. In Feb. he pushed south with food supplies and established depots as far as 82 south latitude, returning to winter quarters. The sun disappeared April 22 and reappeared Aug. 24. On Sept. 8 he started for the pole, but, finding the date too early, he returned to winter quarters. On Oct. 20 with 4 men, 4 sledges, 52 dogs and four months' provision he made his final start for the goal. On Nov. 17 he reached the great ice barrier, latitude 85°, and climbed to the top of the polar plateau, to a height of 10,000 feet. Here he killed 24 dogs, and with 18 dogs and three sledges pushed on over a vast plateau clad in snow and glacier ice, reaching the pole Dec. 14. Here he remained three days, taking observations, and located the pole in a vast plain, which he named King Haakon VII Plateau. Returning he reached his winter quarters Jan. 25, and on March 7 he cabled to Christiania, Norway: "*Pole attained fourteenth—seventeenth December, 1911. All well.*"

**Anaconda** (*ăn'a-kŏn'dă*), a large serpent allied to the boa-constrictor, is found in South America, especially in Brazil and in Guiana. It sometimes grows to the length of forty feet, and is the largest serpent in America. It passes much of the time in the water, choosing the shallow parts of a lake or stream. It is not poisonous.

**Anacon'da, Montana,** a city, the county seat of Deer Lodge County, situated about 28 miles west by north of Butte, and reached by the Northern Pacific, the Great Northern and the Butte, Anaconda and Pacific Railway. Its chief industry is copper-smelting, the works of which employ usually about 3,000 men. The town is growing rapidly, and has some fine public buildings, including the Hearst Free Library, several banks, opera houses, schools, etc. It has also a system of public parks. Its industries include foundries, railway and machine shops, brick works and copper smelting. A gold mining district 20 miles west is reached by an extension of the B. A. & P. Population 12,000.

**An'æsthet'ic,** the name applied to any agency which causes either partial or complete insensibility to pain. There are two kinds of anæsthetics: those called local anæsthetics, which affect only a limited area; and those called general anæsthetics, which cause temporary insensibility of the whole body. Anæsthetics of various kinds were used by the ancient Greeks and by the Chinese as early as the third century A. D. When men began to study chemistry systematically, toward the close of the eighteenth century, various anæsthetics were discovered, but it was some time before they came into common use. In 1844 Dr. Horace Wells of Hartford, Conn., used nitrous oxide gas to render the extraction of teeth painless. In 1846 Dr. Morton of Boston employed the vapor of sulphuric ether for the same purpose, and afterwards applied it in cases requiring surgery. In 1847 Sir James J. Simpson of Edinborough announced the discovery of chloroform,

and suggested its use instead of ether. These three anæsthetics are taken into the system by inhalation. Local anæsthesia is produced by chilling with ice or by the evaporation of some volatile substance like ether or rhigoline. Cocaine is also used extensively for this purpose.

**Anam'.** See COCHIN CHINA.

**Anarchism,** a communistic and revolutionary theory adverse to social order, law and government, and manifesting in its votaries—generally men of grandiose ideas lacking in mental equilibrium—an unnatural aversion to their kind, especially if well-to-do and influential, and an implacable fanaticism. The leaders of the movement have been men of prominence in various countries, acting under the impulse given it by such eminent writers as Karl Marx of Germany (1818–83), Pierre J. Proudhon (1809–65), the French socialist, William Godwin, the English political writer (1756–1836) and author of the famous *Enquiry Concerning Political Justice*, Elisee Reclus, the French republicanist, and Prince Krapotkin, the Russian nihilist and revolutionist (1842) and propagandist of social reform. Some of these men are idealists rather than revolutionists, and are opposed to assassination and violent measures in ridding the world of tyrannical rulers and bureaucratic administration. Others of them, however, including many of their more hasty and hotheaded followers, are eager for the overthrow of the existing social order, and are fanatical in their desire to overturn society and give rein to extreme individualistic theories, including resistance by force to all repressive, orderly authority. Hence have come the bomb-throwing and the anarchical assassinations which have been the terror of the time, including revolutionary conspiracy.

**Anat'omy.** It is a common mistake to suppose that anatomy applies only to the bones; on the contrary, it includes the structure of both animals and plants. Just as the architecture of a house shows its plan of construction, so anatomy, or the architecture of animals and plants, shows how they are constructed, and with the higher animals this is a very complex thing. The physicians and medical men were the first to take an interest in the anatomy of the human body, because a knowledge of it is necessary for medicine, and it thus happens that the earliest observations in this line were directed toward making known the structure of the human body and of animals rather closely related to man in points of structure. Anatomical study, therefore, began with the most complex animals instead of with the simpler ones, and this led to many misunderstandings. It was so difficult in the early days to get an opportunity to study the human body that the pioneer anatomists were obliged to gain their knowledge by dissections of animals like the dog and occasionally of a monkey. Aristotle (B. C. 384–322) and other ancients learned a great deal about anatomy in this way.

About B. C. 300, the dissection of the human body was legalized in the Alexandrian school, the bodies of condemned criminals being devoted to that purpose. But this did not become general, and anatomy continued to be studied mainly from brute animals.

Finally, in the early part of the Christian era, Galen (130–200 A. D.), became accepted as authority, from the 2d century, in which he lived, to the revival of anatomy in the 16th century. During the decline ot intellectual life, in the dark ages, there was no progress. In the 14th century, observations were renewed, but no particular advance was made for about two centuries. Then a highly-gifted man of great intellectual power — Vesalius (1514–1564)—was born, who gave himself to the study of anatomy. Under his hands the science underwent a revival, and his work marks an epoch. In 1543, at the age of 29, he published a book (*De Corporis Humani Fabrica*), most beautifully illustrated, which is accepted as laying the foundations of modern anatomy. In this book he corrected many errors of Galen, and claimed that the knowledge of that anatomist had been gained from the bodies of apes and other brute animals, and not from man. Vesalius had with great difficulty procured the bodies of some criminals for his studies, and he reaped the displeasure of the authorities and of the Inquisition, by whom he was threatened. He found himself in controversy with his teachers and contemporaries, most of whom defended the authority of Galen, but in due course of time his position was triumphantly established and the authority of Galen overthrown.

Anatomy began now to assume more importance, and there arose famous teachers of the subject. The Italians were at this time in the lead—the prejudices against dissection in Germany, France and Britain prevented the development of the subject in those countries. The school at Padua became deservedly famous, and students were attracted to it from all over Europe and Britain. From England, William Harvey (1578–1657) found his way to Padua as a medical student. In the early part of the 17th century, he made an epoch in both anatomy and physiology by the demonstration (1628) of the circulation of the blood. Among the famous Italian teachers of the period were the leaders in anatomy: Vesalius, Fallopius and Eustachius (from whom is named the Eustachian tube). Thus in the 16th century human anatomy was well established.

The subject became broadened. Naturalists began to take more interest in animals and plants, and there gradually grew up those who compared the structure of higher animals with the simpler ones. These comparisons brought out so many resemblances and so many remarkable facts as regards construction, that anatomy, which seems at first a dry subject, became endued with great interest. Presently it was discovered that insects have a most beautifully constructed organization; that they have delicately formed organs for digesting their food, with fine salivary glands, a remarkably beautiful nervous system, breathing tubes, etc. Thus there was opened a new world to anatomists. These studies in minute anatomy fascinated all who undertook them; and well they might, for there are no more beautiful illustrations in nature of delicate structures nicely adapted to the purposes of life. Malpighi the Italian and two Dutchmen, Swammerdam and Leeuwenhoek, were the leaders in this field, and the sketches with which they illustrated their studies excite our admiration even to-day. Malpighi and Leeuwenhoek also began to apply the microscope to anatomical study, and a new line of advance was started, involving minute or microscopic anatomy. The same kind of architectural study was extended to the other groups of lower animals, and a great fund of new knowledge was acquired.

At the same period Malpighi, Grew and others laid the foundations of the knowledge of the minute structure of plants.

The interest of naturalists kept deepening, and finally, just at the beginning of the 19th century, the great Cuvier (1769–1832) founded the science of comparative anatomy. The men who have followed in his footsteps and made the work, in this particular line, more modern, are Meckel, J. Müller, Rathke and Gegenbaur in Germany; Richard Owen, Goodsir and Huxley in England; and Joseph Leidy and E. D. Cope in America.

Simultaneous with the work of Cuvier came that of his equally distinguished contemporary Bichat (1771–1802), who, while Cuvier was studying principally the organs, directed his attention to the tissues of which the organs are composed. Bichat took a step further than Cuvier. He founded the Department of Histology or Microscopic Anatomy of organs. This line of analysis was, in 1839–40, carried still further by Schwann and Schleiden, who showed that the tissues are composed of cells. All anatomy since 1840 has been greatly modified and influenced by this cell theory.

Having gained some knowledge of the construction of animals and plants, it is natural that the next step should relate to the process of building. Since it is known that all animals and plants start in a relatively simple microscopic rudiment—a seed or an egg—we wish to know, further, something about the series of steps by which this simple rudiment is converted into the highly complex organism. This line of study is called Embryology or Development. As early as 1769, Wolff showed the true nature of development, viz., that it is an actual process of construction, and not simply the expansion of a preformed miniature, as was quite generally believed in his time. But Von Baer (1792–1876), is regarded as the founder of the modern ideas of development. He showed that all the organs and tissues in the bodies of animals proceed from three first-formed layers of cells or the germ-layers and that corresponding tissues come from the same one of the three layers in all animals above the very lowest. The facts of development, taken in connection with the doctrine of organic evolution, have greatly influenced the progress of anatomy. Comparative anatomy, especially, has been the gainer. The comparative structure of animals assumes new meaning when we understand that the higher animals are connected by a series of gradations with the lower ones, and that the higher animals present many fundamental features of resemblance to the lower ones in very early stages of their development.

This is, briefly, the story of the rise of anatomy. It shows how the study began with a narrow aim,—that of making known the structure of the human body for the use of medical men; then, after various vicissitudes, how it was broadened and deepened to include the structure of all living beings; and how, finally, the story of the development of life was added to that of its structure. Anatomy has thus come to be an important department of biology.

Let us now see what are its principal subdivisions: We must, of course, have descriptive and surgical anatomy for medical men. We must also have physiological anatomy to understand the workings of the organs. We must have microscopical anatomy in health, which is called histology, and in disease, which is called pathology.

The study of comparative anatomy is important to the zoologist and botanist. In these connections, it is usually called morphology, a name contrasted with physiology. In the broad sense, this includes the construction of all plants and animals from the simplest to the highest. Finally, we have anatomy for artists.

But it is all too large a field to be even systematically outlined here. For a knowledge of the facts of anatomy one must consult special books. Gray's and Quain's *Anatomies* are the ones most used at present by medical students. For comparative anatomy of vertebrates, the manuals of Gegenbaur and Weidersheim are recom-

mended. For general morphology, Thompson's *Zoology* and Parker and Haswell's *Text-book of Zoology* are among the best. For comparative anatomy of invertebrates, see Lang's *Text-book of Comparative Anatomy*. WM. A. LOCY.

**Anaxagoras** (*an-aks-ag'ō-ras*), a Greek philosopher of Clazomenæ, in Ionia, born about 500 B. C. At Athens he had for his pupils Pericles, Thucydides, Euripides and Socrates. He is spoken of as the first theist among philosophers, since he deemed reason the source of truth and matter the creation of an eternal Being, which he called **νους** (Intelligence). His atomic theory was thought at the time to be a slur on the gods, and for that he was banished, proceeding to Lampsacus, Mysia, where he taught until his death about 428 B. C.

**Anchises** (*an-kī'sēz*), in Greek legend. the son of Capys and father, by Aphrodite, of Æneas, the Trojan hero. At the burning of Troy, Æneas rescued him and bore him on his shoulders out of the city and made him the companion of his voyage to Italy. On the way thither, Anchises died in Sicily.

**Ancho'vy,** a small fish related to the herring, much used as a relish and for sauces, etc. They abound in the Mediterranean Sea and on the southern shores of Europe. Anchovies are also found on the coasts of the United States.

**An'cient Mar'iner, The,** a romantic poem written by Samuel T. Coleridge in 1797, first appeared in the famous volume of *Lyrical Ballads*, by Wordsworth and Coleridge which appeared in 1798. Wordsworth appears to have suggested some of the incidents of the story, for instance, the suggestion of a spectral persecution for a crime and the incident of the albatross. But the imagination and melodious beauty of the poem belong to Coleridge alone. The story is of an ancient mariner, who holds one of three wedding guests by the weird influence of his story and the glitter of his eye. He tells of a voyage to the South Seas, of heat and fog and mist, of the slaying of the bird that was thought to have caused it and of the punishment of the crew who perished and himself who lived in the clutches of the "Nightmare life-in-death." The rime concludes with the moral:

"He prayeth best who loveth best
All things both great and small;
For the dear God who loveth us,
He made and loveth all."

The ancient mariner had indeed broken the spell of evil about him, at least in part, by the love that gushed out of his breast towards the beauteous water-snakes that were playing about his stricken ship. Yet it is better to regard this poem as a perfect work of imagination than a too severe parable.

**Anco'na,** a city of Italy on the Adriatic Sea. It was one of the chief naval stations of the Romans. At that time its citizens made a famous purple dye, used in coloring the cloaks worn by kings and emperors. On its mole stands a triumphal arch in honor of the Emperor Trajan, which is said to be the finest marble arch in the world. Ancona has a fine harbor; it is to-day the chief seaport between Venice and Brindisi. Population 63,145. The province of the same name has an area of 748 square miles, and a population of 318,683.

**Andalusia** (*ăn'dà-lōō'shĭ-à*), the most southern district of Spain. It is crossed by the Sierra Nevada Mountains and is watered by the Guadalquivir River. Here the Moors set up their famous kingdom and threatened to overrun Europe. The Andalusian towns, Seville, Cordova, Jaen and Granada were the Moorish capitals. The present Andalusians are like the Moors in looks and manners, but are a mixed race, descended from Africans, Carthaginians, Romans, Goths and Vandals as well as Moors. The climate of Andalusia is delightful, and the country is rich in grains and fruit. It has also considerable mineral wealth. Its area is 34,000 square miles. Population of the eight provinces included in the area, 3,562,606.

**An'dersen, Hans Christian,** a Danish poet, novelist and writer of children's stories. He was born in Odense in 1805, the son of a shoemaker, who died when his son was nine years old. After a scanty education and various attempts at work, his mother wished to make a tailor of him, but Hans, having a fair voice, preferred to go to Copenhagen for training. There he tried to get work at a theater, but was laughed at for his ignorance and awkwardness. A struggle of a few years, during which he wrote several tragedies, ended by his admission, through the influence of a benevolent man, into one of the government schools. This was the turning point in his life. He soon entered the Royal College of Copenhagen, and while there produced his first work in print, *A Journey on Foot to Amak*, a humorous work, which gained him much favor. Having received a gift of money from the king, he traveled through the south of Europe, describing its beautiful scenery in his great novel, *The Improvisatore*. After his return to Denmark, he was given an annuity by the government, until his death, which occurred Aug. 4, 1875. Among his works are *Only a*

HANS ANDERSEN

*Fiddler, A Poet's Bazar, Fairy Tales Wonder Stories* and *Picture Books Without Pictures*. His books have been translated into all the languages of Europe, and also into Chinese and Japanese. Hans Andersen was tall and thin and wore old-fashioned clothes, but as he walked the streets of Copenhagen the children flocked around him and the boys and girls saluted him. When he died, flowers were sent from many countries, and, later on, all were glad by their subscriptions to help to erect a monument to his memory.

**An'derson,** a city and county seat of Madison County, Indiana, on White River, 36 miles from Indianapolis. It lies in the center of an agricultural region, and besides has extensive manufacturing interests. It manufactures glass, wire fence, steel springs, shovels, files, automobiles, carriages, nails, shovel handles, carriage and buggy materials, tools and tool-workers supplies, encaustic tiles, tin plates, etc. The city has an admirable system of public schools, substantial buildings, a fine library and churches. It has the service of four railroads, and is the center of the traction lines for northern and central Indiana, and located here is the largest power-house in the state. Anderson has all the adjuncts of a modern city, and while the natural-gas flow is somewhat diminished since its discovery in 1887, the supply is sufficient for heating and some manufacturing. Anderson town was settled in 1822, became a county seat in 1828, and the city incorporated in 1865. Population, 30,000.

**An derson, Mary,** an American actress, was born at Sacramento, California, July 28, 1859. When only 13 years old she decided to become an actress. Soon after she met the great Charlotte Cushman, and at once went to New York to study. Here, when but 16 years old, she made her first appearance on the stage as "Juliet," with complete success. She was soon acknowledged to be the leading actress of the United States and became very popular, being known everywhere as "Our Mary." A beautiful, frank, pure-hearted girl, she did much toward convincing Americans that stage life may be pure. She has not appeared on the stage since her marriage, in 1889, to Mr. Navarro, a wealthy New Yorker. In 1896 she issued a volume of reminiscences under the title of *A Few Memories*.

**Anderson, Robert, General** (born 1805, died 1871), was a West Point graduate, serving in the Black Hawk and Mexican Wars, and was wounded at the battle of Molino del Rey. As major of artillery he had charge of the defenses in Charleston harbor in 1860. On the night of December 26, expecting an attack from the South Carolinians, he moved his small garrison from Fort Moultrie to Fort Sumter, as being more easily defended. On April 14, he evacuated the fort after a bombardment of thirty-six hours, marching out with the honors of war. This was the first engagement of the Civil War. He was appointed brigadier-general, but his health prevented his engaging in much active service.

ROBERT ANDERSON

**An'dersonville,** a village in Sumter County, Georgia, noted as the site of a Confederate military prison during the Civil War. Here 12,296 Federal prisoners died in fourteen months, largely the result of exposure and lack of food and sanitation. The superintendent, Henry Wirz, was tried by a military court, found guilty of cruelty to prisoners, and hanged November 10, 1865.

**An'dover,** a town of Massachusetts, on the Merrimac River. It is chiefly known by its educational institutions. It is the seat of Phillips Academy, founded in 1780 as a school for preparing boys for college. This school has a large endowment and is well fitted in every way for carrying on its work. Here, also in 1808, under the same trustees, was founded Andover Theological Seminary, (recently removed to Harvard University), which has sent forth 3,000 Congregational ministers. It has a library of 50,000 volumes. Among its buildings stands the house in which Elizabeth Stuart Phelps wrote *Gates Ajar*. Andover is also the seat of the Abbot Female Seminary. Population, 7,301.

**Andrassy** (*on'drā-shē*), **Julius, Count,** a Hungarian statesman, of an ancient and noble family, was born in 1823. He took a prominent part in the Revolution of 1848, leading the militia against the Austrians and going as ambassador to Constantinople. He was an exile for several years in France and England. He was several times a member of the national assembly, and in 1861 its vice-president. He was Hungarian prime minister of the consolidated Austro-Hungarian empire in 1867-68, minister of national defense, foreign minister and advocate of many reforms. He died February 18, 1890.

**Andre** (*ăn'drā*), **John, Major,** a British officer in the Revolutionary War, hanged as a spy at Tappan, N. Y., October 2, 1780. He was born in London in 1751 and came to America at the age of 23. He became

aide-de-camp to General Grey and afterward to Sir Henry Clinton, who promoted him to the rank of major and made him adjutant-general of the British army in North America. He soon entered into correspondence with General Benedict Arnold, with the object of betraying the American cause to Clinton. In August, 1780, Arnold took command of West Point, on the Hudson River, then the strongest and most important post in the United States. He proposed to begin his treason by giving up this fortress to the British. He asked for a personal interview with André, who went up the Hudson and landed one dark night from the war sloop *Vulture*, about six miles below Stony Point. Here he met Arnold, who gave him a passport under the name of John Anderson, which allowed him to pass the American lines, and also six papers in his own handwriting directing the attack on West Point. These papers André concealed in his stockings, and then started in disguise to ride to New York, for the sloop had been forced to return down the Hudson. At Tarrytown he was stopped by three armed men, to whom he declared himself a British officer, supposing them to be Tories. They belonged to the American side, however, and immediately searched him and found his secret papers. He offered bribes, but they were refused, and he was taken to Tappan, the headquarters of the American army, where he was condemned to be hanged as a spy. Every effort was made to save him, but the rules of war demanded his death. He was hanged in the full uniform of a British officer, calling upon the crowd to witness that he died like a brave man. His talents and the sunshine of his disposition caused him to be mourned by both British and Americans.

**Andrew.** See APOSTLES.

**Andrew, John Albion,** was born at Windham, Maine, May 31, 1818. He was elected governor of Massachusetts in 1860, and four times was his own successor. He was one of the most famous of the "war governors." Within a week after the President's call for volunteers, he dispatched five regiments. His speeches, messages and especially his devotion to the welfare of the soldiers made him very popular. He died October 30, 1867.

**Andrews, Elisha Benjamin,** an American educator, formerly president of Brown University and now chancellor of the University of Nebraska, at Lincoln, was born at Hinsdale, N. H., January 10, 1844. During the Civil War he served in the army, and lost an eye at Petersburg in August, 1864. Graduating subsequently at Brown University, Providence, R. I., he became principal of the Connecticut Literary Institute at Suffield, Conn., and later on was professor of history and political economy at Cornell, and president of Brown University, his alma mater. Owing to criticism by trustees of the University of his belief in the free coinage of silver, President Andrews resigned, though the resignation for a time was recalled and not acquiesced in. He subsequently accepted the superintendency of the Chicago schools. This position he resigned in 1900, and accepted the presidency of Nebraska University. He is the author of a number of standard text-books on history, constitutional and general, and on economics.

**Andromache** (*an-drom'a-kē*), the wife of Hector, and one of the most celebrated and beautiful of the women of Troy. She lost her husband and seven brothers in the Trojan War, became the captive of Pyrrhus, the son of Achilles, and finally the wife of Helenus, a son of Priam. She is the subject of *Andromache*, the tragedy of Euripides.

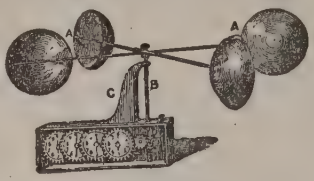
**Andromeda** (*an-drom'e-dä*), in Greek mythology the daughter of Cassiopeia and Cepheus, king of Ethiopia. Boasting that she was more beautiful than Juno, the latter's brother, Neptune, sent a sea monster to threaten her life and ravage the country. From this peril and being chained to a rock, Andromeda was rescued by Perseus, and after death was transformed into a constellation. The constellation, with its satellites, is represented by a woman in chains.

**An'dros, Sir Edmund** (born 1637, died 1714), was governor of the colony of New York for eight years, beginning in 1674; subsequently he was governor of New England for three years. He was deposed by the colonies and then was made governor of Virginia for six years. He was harsh, and ruled without any regard to the wishes of the colonists. This made him disliked, in spite of his acknowledged honesty and uprightness. His demand for the charter of Connecticut is famous. To get it, he went to Hartford with a band of soldiers. The general assembly kept him talking in their hall until night, when candles were lighted and the charter brought in a box and laid on the table. Suddenly the lights were blown out. They were quickly lighted again, but the charter was gone. For three years no one knew where it was, but in 1789, when the new king, William III, had recalled Andros, the charter was carefully taken from the hollow of an oak tree, where it had been hastily put on the night it disappeared. This tree was known as the "Charter oak."

**Androscog'gin,** a river which rises in New Hampshire, flows through part of Maine, and enters the Kennebec River near Bath. Length, 145 miles.

**Anemom'eter,** an instrument for measuring the rate and pressure of the wind. There are several instruments for this purpose; the simplest and the one most used was in

vented in 1846 by Dr. Robinson. It consists of four hollow cups fastened to the ends of two horizontal iron rods which cross each other at right angles, and which are supported on a vertical rod which turns freely. It looks like four spokes of a wheel, at right angles to each other, each having a cup on the end to catch the wind, and the axle in which they are fitted being set up on end. This axle or rod is connected with a set of wheels, which record the number of revolutions. It was found that the cups whirl round with about a third of the velocity of the wind, and so, from the number of the revolutions, it is easy to calculate the rate of the wind. Another kind of instrument is the pressure anemometer. The best known is Osler's. A brass plate is fastened by springs to a vane in such a way that the varying pressure of the wind on the plate causes the springs to yield in corresponding degrees, and this is recorded on a moving sheet of paper by a pencil fastened to the vane; another pencil records the changes in the direction of the wind, and usually a third pencil, guided by a rain gauge, shows the amount of rain that has fallen.



ANEMOMETER

**Anemone** (*ă-nĕm'ō-nē*), called also the wind-flower, is one of the most beautiful of our spring flowers. It grows wild in woodlands and pastures. When growing in the shade, the colors are pink, rose color or purple; in the sun, they appear white or slightly flushed with rose color. The flowers of the wild anemone are single, but they can be doubled by cultivation. At the approach of night or of rain they curl up and go to sleep. The plant is well fitted to be an early spring blossom, for its slender stem bends but does not break in strong blasts. Poetry and myth give many stories of this flower. The Greeks said *Anemos*, the Wind, sent forth the starry blossoms as heralds of spring. It was believed that only the wind could open the flower—

"The coy Anemone, that ne'er uncloses
Her lips, until they're blown on by the wind."

It is called *Windröschen* (little wind-rose) by the Germans. It is widely distributed in Asia, prized by the Chinese, a great favorite in Europe, Canada and the United States.

**Aneroid.** See BAROMETER.

**Angel'ico, Fra** (the angelic), a Dominican monk and the most celebrated of early Italian painters, was so called because of the beauty of the angels and saints he painted. He never would take money for his pictures, and always prayed before commencing a picture. His *Coronation of the Virgin* is in the Louvre at Paris. His era is 1387–1455.

**Angell, James Burrill,** LL. D., American educator and diplomat, was born at Scituate, R. I., January 27, 1829. A graduate of Brown University, he afterward traveled abroad and returned to take the professorship of modern languages at his alma mater. In 1866, he became president of the University of Vermont, and five years later exchanged the post for that of president of the University of Michigan, resigning the office in 1909. In 1880-81 he acted as United States minister to China, and later he negotiated for the government some important treaties. He was American minister to Turkey and served on international commissions, especially on those dealing with Canadian-American fisheries and deep water ways. He died in 1916.

J. B. ANGELL

**Angelo, Michael** (*mī'ka-el ăn'jā-lō*), an Italian sculptor, painter and architect, was born near Florence in 1475. (The great painter's name is frequently written as one word—"Michelangelo"; or, in Italian, "Michelagnolo Buonarroti"). He began to draw as soon as he could use his hands, and his early paintings on the walls of the house where he lived as a boy were once shown. A great merchant prince, Lorenzo dei Medici, opened a garden in Florence filled with statues. Here Angelo went often to draw, and his first piece of sculpture, a copy in marble of a laughing faun, so pleased Lorenzo that he took the boy into his own house, treating him like a son. His *Sleeping Cupid* brought him to the notice of all Italy, and got him an invitation to come to Rome. Here, besides other statues, he carved his *Pieta*, the mourning Mary with the dead Christ in her lap, now in a chapel of St. Peter's. From now on his life was of the busiest. A huge block of marble, 18 feet long, lay outside the cathedral at Florence. One sculptor had hacked at it and half spoiled it, but out of it Angelo cut his statue of *David*. The pope gave him an order for a tomb, and Angelo's design was so magnificent that it was decided to rebuild St. Peter's as a fit covering for it, and Michael Angelo was made the architect. The Sistine chapel was to be ornamented, and in 20 months the great painter had covered the whole ceiling with the beautiful frescoes that may be seen there today. It was on the walls of this chapel that he afterward painted his *Last Judgment*. Michael Angelo was a poet, and wrote beautiful sonnets;

and also an engineer, and built the fortifications of Florence. Besides possessing genius, he had a passion for work. He carved till his hands could no longer guide a tool, only giving up his work at the age of 90, when he said, "Death often pulls me by the coat to come with him." He died in 1564.

**Angiosperms** (*ăn'jĭ-ō-spermz*). One of the two divisions of seed plants, or *Spermatophytes*, the other being *Gymnosperms*. It is the highest and most recent great group of plants, and to it belong almost all the plants of ordinary experience. The group contains over 100,000 described species, and at the present time furnishes the chief vegetation of the earth's surface. To it belong all the true flowering plants, as well as the plants directly useful to man. The bodies of angiosperms are exceedingly varied in size, habit and duration. They range in size from no larger than the head of a pin to the giant redwood, in habit, from floating and creeping to erect, in duration, from a few weeks to centuries. The name refers to the fact that the seeds are inclosed in a case, and are not freely exposed as in the *Gymnosperms*. The two subdivisions of angiosperms are the *Monocotyledons*, to which grasses, lilies, palms, orchids, etc., belong; and the *Dicotyledons*, to which the common trees, buttercups, roses, mints, sunflowers, etc., belong. For a further account see MONOCOTYLEDONS and DICOTYLEDONS.

**Anglin, Hon. Timothy Warren.** Born and educated in Ireland. Came to New Brunswick in 1848 where he founded the *Morning Freeman*. Sat in the New Brunswick Assembly from 1861 to 1866, opposed to Confederation. Elected to the House of Commons at Ottawa. Elected speaker in 1874. A very influential member of the Roman Catholic Church. His death occurred in 1896.

**An'glo-Sax'on,** the name of the German tribes that invaded England just after the Romans had left it. They came mostly from three tribes, the Saxons, Angles and Jutes, all living on or near the Danish peninsula. They subdued and overspread the country, driving the Britons, who were of the Celtic race, before them. They founded the seven kingdoms, Kent, Sussex, Wessex, East Anglia, Mercia, Essex and Northumbria, which were banded together for protection into the Heptarchy or Seven Kingdoms, and afterward united in one nation called England, from the Angles. Each of the seven divisions had its king and a queen, who were treated with great respect. Next came the athelings or high nobles; then the thanes, who were landed farmers. Below these were the churls, who were retainers of the thanes, and lowest of all were the slaves, most of whom had been prisoners of war. The Anglo-Saxon language is the German language spoken by these tribes, mixed with a few words of Celtic spoken by the Britons and many Latin words introduced by the monks, who were the only scholars then in the country. Although the English language grew out of the Anglo-Saxon, we cannot read it now without studying it like a new language.

**Ango'la,** a Portuguese colony on the west coast of South Africa, in lower Guinea. It has an area of 484,800 square miles; population, 4,119,000. It was discovered by the Portuguese in 1484, and is still in their possession. The capital is St. Paulo de Loando. An army of 5,000 men, four war vessels and the cost of maintaining the packet service eat up almost the entire revenue of the colony. The country has a coast line, between the mouth of the Congo and German Damaraland, of over 1,000 miles; the boundaries separating it from the Congo Independent State and from French, German and British possessions in southwestern Africa have been adjusted by conventions in the past fifteen years. Angola is divided into six districts: Congo, Loando, Benguella, Mossamedes, Huitla and Lunda. It has a large export trade in coffee and rubber, besides ivory, cocoa nuts, vegetable oils, oxen and fish. Estimated revenue 1910–11, 2,321,373 milreis; expenditure, 3,171,373 milreis. It has over 300 miles of railroad in operation. A trunk line of railway is projected between Lobito Bay, near Benguella, on the coast, to the eastern frontier of the colony, about 900 miles, and work has begun. In 1909 there were 69 telegraph offices with 1,940 miles of line in operation. The trade is largely with Portugal.

**Angora Goat.** See GOAT.

**An'gus, Richard B.,** of Montreal, capitalist. Born near Edinburgh, 1830. Came to Canada in 1857 and joined the staff of the Bank of Montreal. In 1861, placed in charge of the Chicago agency. Later local manager at Montreal and in 1869 general manager. For ten years he achieved brilliant success in this position. In 1879 he retired to take the position of general manager of the St. Paul, Minneapolis and Manitoba Railway. In 1880 he was one of the Stephen (afterward Lord Mount Stephen) Smith (Lord Strathcona) syndicate, which built the Canadian Pacific Railway, which was completed in 1885. This was the leading incident in a phenomenally successful career. He is a governor of McGill University, president of the Board of the Royal Victoria Hospital and a director of the Bank of Montreal, possesses a valuable art gallery; and is one of the most prominent of successful Canadians.

**Aniline** (*ăn'ĭ-lĭn* or *lēn*), a colorless, oily and poisonous liquid, discovered 80 years ago as a product of the dry distillation of indigo, but now mainly derived from the

benzene of coal-tar. It is largely used in the manufacture of dyes, now an extensive industry since the development by chemists of the variety of aniline and coal-tar colors and their application in dyeing and calico printing. On exposure to air and light aniline takes on a dark red color, and it boils at 183° C. United with acids, it forms crystallized salt.

**Animal'cula.** See PROTOZOA.

**Animal Kingdom,** the name applied to the group containing all animals, separating them from the vegetable and mineral kingdom, respectively. It is a very old arrangement to divide all nature into three kingdoms—animal, vegetable and mineral. Cuvier named one of his most famous books, the *Animal Kingdom* (*Règne Animal*), and in it divided animals into four divisions, based on their plan of construction, as follows: *vertebrata*, the backboned animals; *mollusca*, the soft-bodied animals, such as snails, clams, etc.; *articulata*, all jointed animals, thus including lobsters and crayfishes with the worms; *radiata*, animals like the starfishes, sea anemones, etc., having a radial arrangement of parts. These divisions have long been out of use, for the reason that they do not represent the real state of the case. The animal kingdom is now divided into a larger number of branches, called sub-kingdoms. While there is a tendency to increase the number, the following eight sub-kingdoms represent a modern arrangement. 1. Protozoa, the simplest animals, microscopic and single celled. All animals above the protozoa are many-celled, and are spoken of collectively as metazoa. 2. Porifera, the sponges. 3. Cœlenterata — the jellyfishes, hydroids, sea anemones, coral animals, etc. 4. Vermes, the worms, a very large and complex group, including the jointed worms, leeches, earth worms, the smooth worms, the shelled worms, like brachiopod shells, etc. 5. Echinodermata, animals with spiny skins, like starfishes, sea urchins, sea cucumbers, etc. 6. Arthropoda, the articulated animals, with jointed limbs—spiders, insects, myriapods, crustacea. 7. Mollusca — snails, oysters, clams, cuttle-fish, etc. 8. Vertebrata: this group includes some of the animals formerly classed with the worms and mollusca. The majority of them have a backbone composed of vertebræ, but not all of them. The sub-kingdoms are coordinate divisions; in other words, equivalent groups. They are further divided into Classes, the classes into Orders, the orders into Families and smaller divisions. On account of the importance of the Vertebrata, the five Classes are named: Fishes, Amphibia, Reptiles, Birds and Mammals. See the different sub-kingdoms under their respective headings.

**Anjou** (*ān-zhōō'*), an ancient province in the northwest of France, area about 3,000 square miles. In the 12th and 13th centuries it was a possession of the English kings, and from it came Godfrey, Count of Anjou, who, in 1127, married Matilda, daughter of Henry I of England, and so became the ancestor of the Plantagenet kings. In 1480 it reverted finally to France, in the reign of Louis XI.

**Anam',** a country, forming part of the peninsula of Indo-China, bordering on the China Sea, and lying between the Gulf of Siam and the Gulf of Tonquin. It is flanked on the west by Siam and on the north by China. Today, it forms, with Cambodia, Tonquin and Cochin-China, the chief Asiatic possession of France. It has an estimated population of 6,124,000, and an area of 52,100 square miles. It was acquired by France in 1884, and the affairs of the protectorate are under the control of the French government. Three of its ports are open to European and American commerce. Its exports include, besides rice and raw silk, sugar, cinnamon and medicinal plants. Hué is the capital with a population of 50,000. See COCHIN CHINA.

**Annap'olis,** a picturesque old seaport is the capital of Maryland, and the seat of the United States Naval Academy. The city is on the Severn River, two miles from Chesapeake Bay. It was first settled in 1649 as Providence; it became the state capital in 1694; and in 1708 the town was renamed in honor of Queen Anne. In colonial days Annapolis was one of the foremost of American cities, and became known as "The Athens of America." The Continental Congress sat there from November, 1783, to June, 1784; General Washington there resigned his commission as commander-in-chief of the Continental Army, December, 1783; and in September, 1786, representatives of five of the states assembled in the Annapolis Convention for the purpose of promoting the commercial interests of America. This convention recommended the calling of another, and the recommendation resulted in the Constitutional Convention of 1787, which devised the constitution of the United States. The United States Naval Academy, founded in 1845, has been located at Annapolis since its organization. The city is also the seat of St. John's College, established in 1789, and St. Mary's Seminary. Population, 8,609.

**Annapolis** or Annapolis Royal, formerly Port Royal, is the county seat of Annapolis County, Nova Scotia, situated on Annapolis Basin, opening from the Bay of Fundy. It is the oldest European settlement in America to the north of Florida, having been founded by De Monts and Champlain in 1604. It has an estimated population of 1,105 the county containing about 20,000 souls. The ruins of the ancient fortress, still imperial property, are of interest, but there are no remaining proofs of the early

# LENGTH OF LIFE AMONG ANIMALS

One of the most interesting things in the study of animals is the length of life of which they are capable. A May fly, for example, born at 1 o'clock, is approaching old age by 4, and by 5 has passed away; while a whale who saw Columbus discover America might still have been spouting until near the end of the 20th Century. Insects, fortunately, are short lived; otherwise, life would be pretty hard for all the rest of us. But other small creatures, you notice, are quite long lived. A saucy little sparrow, for instance—if nothing happens to him—could keep chattering at you off and on from the time you learned your first baby words until you reached middle age.

French occupancy. It was named from Queen Anne on its capture by the British in 1710, and was ceded to the British Crown in 1713. See NOVA SCOTIA.

**Ann Arbor, Mich.,** an important town and railroad center, the county seat of Washtenaw County, situated midway between Detroit and Jackson on the Huron River. It is the seat of the University of Michigan, University School of Music and the Ann Arbor High School. This latter institution supplements or prepares its students for the University and its enrollment embraces pupils from all parts of Michigan and of the United States as well as foreign countries. It has many important manufacturing concerns, mills, machine shops, etc. Population, 14,817.

**Anne,** queen of England from 1702 to 1714. She was born near London in 1665, was the daughter of James II, and married Prince George of Denmark. She came to the throne at the death of her brother-in-law, William III. During her reign occurred the War of the Spanish Succession, in which the Duke of Marlborough won his famous victories. The union of England and Scotland under the name of Great Britain was made while she was queen. Her reign is known as the Queen Anne age of literature, because of the many illustrious writers of the period: Addison, Pope, Dryden, Swift, Defoe and the great scientist, Isaac Newton. Though the mother of 17 children, Queen Anne left no heirs, and was the last sovereign of the house of Stuart.

QUEEN ANNE

**Anne Boleyn.** See BOLEYN, ANNE.

**Anneal'ing,** the process of tempering certain metals and glass to increase their tenacity and render them less brittle by cooling them slowly after they have been submitted to a high temperature of heat. Badly annealed glass, it is well known, will break with a sudden change of temperature, and to obviate this glass vessels are annealed in trays in a long oven, one end of which is hotter than the other—the process of annealing being to draw the trays slowly into cooler and cooler portions of the oven. Cast iron is similarly annealed for tinning; while steel and other metals are tempered after much the same process is undergone. The annealing of the softer metals is done by immersion in boiling water, which is then slowly cooled.

**An'niston, Ala.,** a progressive city, the county seat of Calhoun County, situated in the Blue Ridge chain of mountains. It is located on the Southern, Louisville and Nashville and Seaboard Air Line railroads about 62 miles east by north of Birmingham. Its exports include coal, iron, cotton and lumber; and its industries, coal and iron mining and the manufacture of soil pipe, cotton yarn and cloth, table linen, hosiery, frogs and switches, car wheels and locomotives. Its educational institutions include excellent public schools, an Episcopal school for girls, a Presbyterian College and Barber Seminary for colored girls. Its many beautiful churches include the noted St. Michael and All Angels. Population 15,256.

**An'nuals.** Plants which endure only a single growing season. See DURATION.

**An'nulus.** A structure developed in the wall of the spore-case (*sporangium*) of the ordinary ferns to assist in discharging the spores. See FILICALES.

**An'selm,** Archbishop of Canterbury, was born in Piedmont in 1033. He studied at Bec in Normandy and became renowned for his learning. He was elected abbot of Bec in 1078, and in 1093 was chosen archbishop of Canterbury in England. Anselm quarreled so fiercely with the king, William Rufus, in regard to the relation of church and state that he was exiled from England. He was recalled by Henry I with whom the quarrel was continued. The controversy was finally settled by a compromise. The king permitted the bishops to be elected, though the election was to take place at his court. The rights of the crown were secured by the act of homage on the part of the bishops when they received their lands; the spiritual rights of the church were recognized by the anointing of the bishops by the archbishop and their investiture with ring and crozier at his hands. Papal jurisdiction was not excluded, but no papal legate could come into England without the king's permission. Anselm was the author of many books on theology and philosophy. He died in Canterbury in 1109, and was buried there.

**Anso'nia, Conn.,** a city of New Haven County, on the Naugatuck River, near the city of Derby and the junction of the Naugatuck with the Housatonic River. It is on the line of the N. Y., New Haven & Hartford railroad, about 12 miles west of New Haven. It has a number of manufactories, chiefly of brass and copper products, clocks, electrical works, webbing and knitting goods, carriages and hardware. Ansonia was founded in 1844 by Anson Greene Phelps, and the public library of the city was erected to his memory by his granddaughters. Population 15,152.

**Ant,** an insect related to bees and wasps. More than two thousand species have been described. One authority thinks there are probably as many as 5,000. All ants are social, and live in communities, old ones con-

taining hundreds of thousands of members. Ants of one community are not friendly with those of another; either they have nothing to do with them or quarrel with them. The work of a community is wonderfully portioned out. There are big workers and little workers. In some species there is a class that does the fighting, a soldier class. In a colony are the females, which are largest in size; the males; and the workers or nurses, which are the smallest.

After the pairing season the males are allowed to stray away and soon die. The females and workers are very long-lived. The queens are carefully guarded by the workers, but occasionally one of them escapes and founds a colony. There are four

builders of their wonderful colonies with their houses and streets, by processes of mining, masonry and carpentry. The mining ants dig long galleries in the clay, removing the rubbish, building pillars to support the work and covering the whole with a thatch of grass stems. The red and yellow field-ants are the masons. They first raise pillars and then spring arches over them, covering them with the loose piles of soil which we know as ant-hills. The carpenter ants bore their cells in the solid timber of trees, side by side, with partitions no thicker than paper. A kind of ant in Australia builds its houses of leaves fastened together with a kind of glue. Ants are very strong, carrying animals for

*Red Wood Ant.* 1 Male. 2 a and b. Worker magnified. 3 Female. 4 Worker's head. 5 Larva. 6 Shelter of Pupæ, so-called ant-house. 7 and 8 Pupæ magnified.
*Horse Ant* (natural size). 9 Worker. 10 Male. 11 Female.

stages in the life history of ants: egg, larva, pupa and perfect insect. The eggs are laid by the queen and carried about by the workers or nurses, exposed to the sunlight during the day and protected from the dampness at night. As soon as the white, legless larvæ are hatched, they are treated in the same way, being fed by a liquid from the stomach of the nurse, until they reach the proper age to spin their own cocoons around them. The cocoons represent the pupa stage; they are commonly called ant-eggs, and are carefully tended by the workers. When ready for their second birth, the young ants are cut out of the inclosing cells.

The workers are the most interesting of the three classes of ants. Besides acting as nurses, they supply all the food and are the

food, or masses of material several times larger than themselves. They eat various kinds of food, both vegetable and animal, other insects, honey, sugar, fruit, etc. They are fond of the honey-dew produced by little insects called aphides, and some kinds of ants capture these insects and use them as milch-cows. Many ants live on decaying vegetable and animal matter. In some hot countries are large, flesh-eating ants, which move in swarms over the land, searching for insects of all kinds, each carrying his prey. In South America, when a swarm is seen approaching, the people leave their houses and let the ants clear out the insects which infest them. In Texas is a kind of farming ant, which is said to plant, cultivate and harvest a kind of grain, laying it up in cells

for a rainy day. This kind also "builds paved cities, constructs roads and keeps a large military force."

Some varieties, like the amazon or warrior ant, are slaveholders. They go out on warlike expeditions against tribes of smaller ants and capture their eggs and cocoons, which they bring home, dooming the ants hatched from them to lifelong labor.

The honey ant is a very curious creature, having a distended abdomen filled wholly with honey. Active workers bring in the honey, and it is stored with the honey-bearers. These cling to the ceiling of the underground chambers, and in time of need give forth their store drop by drop.

The common household ants are the little red ants, the small black ant and the pavement ant. Their nests, usually in walls, are very hard to locate. Their presence can be discouraged by spraying with kerosene the crack through which entrance is had to kitchen or pantry.

There are various kinds of ant homes. Some have underground chambers and galleries, some occupy chambers and galleries in decaying wood. Some ants construct mounds. Some build nests of a paste-like substance. In the tropics there is a great variety in materials used and manner of building.

The only insects likely to be mistaken for ants are the termites or white ants, which belong to an entirely different order of insects. These latter live in vast communities, generally in the tropics, and do much damage by eating out the interior of articles of furniture, chairs, tables, sills of houses, etc. They are very productive, one female laying as many as 80,000 eggs. Their homes are very large, sometimes twelve feet high, in the shape of a cone, and so strongly built that a man may stand upon them. The queen is imprisoned in a large chamber in the interior.

Ants have been a most interesting object of study from the earliest times; reference being made to them in the Bible and in poetry and fable. Many stories are told of their seeming intelligence, much written of the curious features of their lives — their battles, their mushroom-growing, the many guests they entertain in their colonies, the cleanliness of their homes, etc., etc. See Lubbock: *Ants, Bees and Wasps;* McCook: *The Agricultural Ant; The Honey Ants* and *Tenants of an Old Farm;* Howard: *The Insect Book;* La Fontaine's fable: *The Grasshopper and the Ant.*

**Antæus** (*ăn-tē'ŭs*), in ancient fable, a giant of Libya, son of Neptune and Terra. He was a mighty wrestler and could not be conquered so long as he remained on and was in contact with the earth. Whoever came to Libya had to wrestle with him, and with the skulls of the slain he built a temple to his father Neptune. Hercules finally conquered him by lifting him from the ground and strangling him in the air.

**Antarc'tic,** meaning opposite to the Arctic or northern pole.

**Antarctic Circle** is one of the smaller circles of the globe, twenty-three and a half degrees from the south pole.

**Antarctic Ocean,** is the name of the ocean lying within the Antarctic circle. It was long thought impassable for ships on account of the ice, but of late years many voyages have been made and tracts of barren land observed. The features of the Antarctic Ocean are constant fogs and currents, unnumbered icebergs and the beautiful *aurora borealis* (which see).

**Antarc'tic Exploration.** Since the notable expedition in 1840, to the South Polar Seas, of Captain James Ross and Dr. (Sir Joseph) Hooker in the Erebus and Terror, there have been several researches in the region. In 1901–4, Captain R. F. Scott penetrated by sledges the interior of Victoria Land, and carried the British flag to 82° 17′ S. Other expeditions embrace those of the German Antarctic Expedition (1901–03); the Swedish Expedition in the Antarctic, which was lost; and the Scottish-National Antarctic Expedition (1902–04) in the Scotia. A notable expedition was that of Lieutenant Shackleford, who sailed from England in Aug., 1907, and reached latitude 88° 23′, Jan. 9, 1909. It remained for Roald Amundsen to win the long-sought prize. Sailing from Norway in 1910, he wintered in Whales Bay, and in Oct., 1911, started with a dog and sledge outfit for the south pole. Climbing the ice barrier to the great polar plateau and struggling over the great polar plain, he reached the pole Dec. 14–17, 1911.

**Ant-Eater,** a toothless animal found in Central and South America feeding on white ants and other insects. The long, flexible tongue, covered with sticky saliva, is protruded among the insects and suddenly withdrawn when a number have collected

ANT-EATER

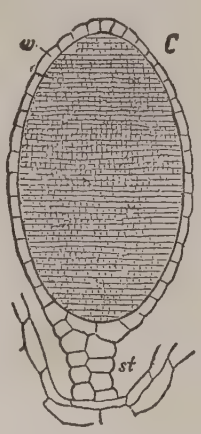
upon it. There are a number of forms. The great ant-eater is about four feet long with a large tail covered with bushy hair. The color is gray, marked by a band of black on the breast and toward the shoulders; the feet and forelegs are white. The claws are long and strong, adapted for digging. It sleeps a great deal, and lies curled up with its

tail spread out to protect it from sun and rain. In defending itself, it makes good use of its strong forearms.

**An'telope,** an animal like the deer, belonging to a group between cattle and goats. Its horns are ringed and hollow and are not renewed annually. The size varies greatly, the pygmy antelopes of South Africa being only from eight to nine inches in height, while the largest kinds are from five to six feet. Antelopes are found in Europe, Asia, Africa and America. They are the fleetest as well as the most beautiful and graceful of quadrupeds. Two kinds are peculiar to North America—the Rocky Mountain goat, which is a true antelope, and the prong-horn. The latter stands apart from the true antelopes, from the circumstance that annually it sheds the outer sheath of its horns. There is an interior bony core that remains permanent. These animals are distributed from the Missouri River to the Pacific and from 53° N. latitude southward into Mexico. At one time there were immense herds in the San Joaquin Valley in California. They are now abundant in northwestern Mexico. The common antelope is found in India and Eastern Asia. It is about two and a half feet high at the shoulders, with erect diverging horns bent in a spiral form. It is so swift that greyhounds cannot catch it, and it leaps easily a height of ten or twelve feet, while the length of its bound is often ten or twelve yards. The Chinese antelope is found in the deserts of Central Asia. Its flesh is very much prized. The gazelle of North Africa was known to the ancients, its beautiful black eyes being often spoken of by Arabian poets. In the Alps we find the chamois and in South Africa the eland, the largest of all the antelopes.

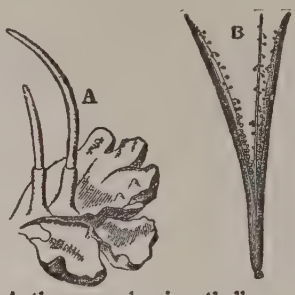
**Anther** (*ăn'ther*). That part of a stamen which produces the pollen. See FLOWER.

**Antheridium** (*ăn'ther-ĭd'ĭ-ŭm*). The male organ of plants. Within it are produced the sperms or their equivalents, which fertilize the female cells or eggs. The antheridium varies in structure in different groups of plants, being for the most part a single cell in the *Thallophytes*, and a several to many-celled structure in the higher groups. It is important to note that the antheridium holds no relation to the anther, the structure in the flower which produces pollen, for the anther is not a male organ. To avoid this confusion it has been proposed to change the name antheridium to spermary.



SECTION THROUGH ANTHERIDIUM OF LIVERWORT

**Antherozoid** (*ăn'ther-ō-zō'ĭd*). A name often applied to the swimming or motile sperm of plants. See SPERM.



Anthoceros, showing thallus with two capsules (A) and mature capsule splitting (B)

**Anthoceros.** A genus of the plants known as liverworts which gives name to the group *Anthocerotales*. The group contains but few forms, but is of great interest from the fact that from it the mosses seem to have developed, and possibly the ferns and seed-plants also. The body (gametophyte) is a simple flat thallus, and produces a slender sporecase (sporophyte) which is remarkable for its continued growth in length and its green color. See HEPATICÆ.

**Anthony, Henry Bowen,** American statesman, was born at Coventry, R. I., April 1, 1815, and died at Providence, R. I., September 2, 1884. Graduating at Brown University, he took early to journalism, and was for a time editor of the Providence *Journal*. In 1849-50 he was governor of Rhode Island, and, nine years later, he entered the United States senate, and was a member of that body until his death, serving frequently on important committees, and acting on several occasions as temporary president of the chamber.

**Anthony, Susan Brownell.** In 1854 a school teacher appeared in Albany, New York, to present a petition signed by 28,000 persons for better laws to regulate the liquor traffic. A member of the Assembly said: "Who are all these signers—nobody but women." Nobody but women—mothers, wives, daughters, sisters who wanted to protect their protectors against evil habits that threatened the home. The teacher, as she turned away, said: "A woman's name on a petition will never be as good as a man's until she has a vote." Susan B. Anthony from that day was an equal suffragist. That thought was her whole creed, precept and practice. For

SUSAN B. ANTHONY

the next half century she gave every day, every dollar, every power of her mind to the work of making a woman's name worth as much as a man's.

Born in South Adams, Mass., February 15, 1820, of a Quaker father, she was given the same education as her brothers, which was unusual in that day. It was not until she began to teach for $10 a month in a position for which a man would have been given $40 that she felt the disadvantage of being born a girl. Her voice was first heard in a New York State Teachers' Association in a demand for equal pay for men and women. At the age of 27 she joined the movement for temperance reform, and she might have preceded Miss Willard in the leadership of that work but for her experience at Albany. She became convinced that the ballot was the only effective weapon to fight with against any and all kinds of moral evil and legal oppression.

Other eminent women were pioneers in this movement, but Miss Anthony was the most original and aggressive of them all, and she was singled out for ridicule. In time her wit, her good-humor, her courage, her intellect, her grasp of political history and the legal status of women won respect and admiration even from people who did not agree with her. There are few to-day who will deny the debt that women owe to her in their privilege of working at innumerable occupations, with equal or very nearly equal pay as men, in their control of their property and children, in their opportunities for higher education and in the fact that women's names on petitions, even when they have no vote, can no longer be dismissed with contempt.

It must be remembered that the cause Miss Anthony made her own was helped along enormously by the Civil War. The roll of the dead forced thousands of timid women into the ranks of bread-winners. From a social disgrace it suddenly became an honor, a patriotic duty for women to work, and necessity opened all the gates of industry and all the gates of preparation for work. Her lectures, her writing, her petitions, her appearance before Congressional committees and her work of organization made her a national character. In 1872 she cast a vote in the presidential election to test her status as a citizen. She was tried before the courts of New York state and fined $100, but refused to pay it, declaring that "taxation without representation is tyranny," just the same as it was a hundred years before. Miss Anthony died March 13, 1906, active and able for her task up to the age of 86. See *Life* by Ida M. Harper.

**Anthracite.** See COAL.

**An'thropol'ogy,** a wide and comprehensive term, otherwise expressed as the science of man, and treating of man's nature, origin, history, etc., especially as a social animal, living in groups either by nature or from choice or necessity. Sociology is a term somewhat akin to it, though specifically dealing with society as a whole, its structure and organizations, the laws of its development, as shown in the evolution of man in communities, and of what we know as actual civilization. Again akin to what is termed anthropology is ethnography, which treats of the races of men in the geographical groups or tribes in which they are met; while ethnology deals with the customs, languages and institutions of mankind in general. Anthropology, in the main, embraces what is usually dealt with in the two latter sciences. The physical aspect and characteristics of the race, varied as they are by climate and temperature, including the cranium, limbs, facial features, height and shape of the body and other descriptive details, belong to the classification of physical anthropology; while the industrial and utilitarian arts in which man employs himself or is employed, together with the tools with which he works, are covered by the term technology. Men in their lawless, vicious state as criminals, felons and outlaws of society, transgressing its laws and defying its proprieties and conventionalities, are studied and treated of under criminal anthropology, by investigators in police offices and prisons, who endeavor to set forth the hereditary, congenital and other causes that create the criminal classes and leave the imprint of crime upon them as a distinct physiognomical and racial type.

**An'thropom'etry,** the science of the measurement of the human body, is of use in the study of different races of men and also of special groups, such as school-children and even criminals. It is of service also in medicine both for the purpose of a more exact knowledge of the symptoms of disease and for the more reliable use of measurements of the average rate and variation of the circulation of the blood, respiration, etc. It is not only necessary to have these measurements in large numbers; but to have them under different conditions. Francis Galton of England was perhaps the pioneer of the science of anthropometry. It was only in 1875 that measurements of average height, weight, girth of chest, etc., were ordered to be made for the British Association. In connection with education, the measurements by Galton, Karl Pearson, Cattell, Edward Thorndike and others are worthy of notice. Many such measurements have been collected by President Stanley Hall in his recent work on *Adolescence* (1908). The system of identifying criminals by means of thumb-marks and other physical measurements is an example of the application of anthropometry in another field. Phy-

sical statistics are often collected by the doctors in charge of large gymnasiums. But scientists now endeavor to measure mental as well as physical traits; and although such measurements are indirect, they represent a greater degree of exactness than mere opinion.

**An'ticos'ti.** An immense island in the Gulf of St. Lawrence, 140 miles long by 30 miles wide. Not suitable for agriculture. It is now owned by Menier, the French chocolate manufacturer.

**Anti-Cyclone.** See CYCLONE.

**Antie'tam** (*ăn-tē'tam*), a creek in Maryland, where was fought one of the great battles of the Civil War, September 17, 1862, between the Union army, with 57,614 men in the field, under General McClellan, and the Confederate, with 38,000 men, under General Lee. The battle raged with great slaughter from early morning until dark. The result was not decisive, the Union loss being over 11,000 and the Confederate loss about 10,000. McClellan did not renew the attack, and on the 18th Lee retreated in safety. But the moral effect was to encourage the north, and on the strength of Antietam President Lincoln issued his proclamation abolishing slavery.

**An'tigo, Wis.,** a city, the seat of Langlade County, on the Spring Brook River and on the Chicago & Northwestern R. R., 206 miles northwest of Milwaukee. Settled in or about the year 1878, the city was incorporated in 1884. Lumbering and agriculture are the chief indutsries of the region, together with its commerical trade. Besides its railroad shops, it has foundries, breweries, flour mills and extensive woodenware establishments, etc. Population, 7,196.

**Antigone** (*an-tig'o-nē*), one of the tragic characters in Greek fable. She was the daughter of Œdipus, king of Thebes. When her father was driven from his throne, she followed him to Attica and cared for him. After his death she returned to Thebes, where Hæmon, son of Creon, the new tyrant of Thebes, fell in love with her. She attempted to bury the body of her brother, who had been slain in war with Creon, and for this offense was ordered to be buried alive or shut up in a cave. Hæmon slew himself by her side. The story of Antigone has been told by several Greek poets; but only the tragedy of Sophocles is now in existence.

**Antigua** (*ăntē'gwȧ*), British West Indies, one of a group of islands (the Windward) which compose the Lesser Antilles, situated to the east of Porto Rico and separating the Caribbean Sea from the Atlantic. It is 54 miles in circumference, enclosing an area of 108 square miles or, with its dependent islands of Barbuda and Redonda, 170 square miles in all. Antigua is the seat of government in the Leeward Islands Colony of Britain, and has, besides a nominated governor and executive council, a legislative council consisting of eight official and eight unofficial members. The chief town is St. John (population, 1911, 9,262); the population of the colony with its dependencies, 38,899. It has a local telephone line 90 miles in extent, is connected with the West India and Panama Telegraph Company's cable, and is reached by periodic steam vessels, direct from England, New York and Canada. Its chief exports embrace sugar, cotton and pineapples.

**Antilles** (*ăn-tĭl-lēz* or *ŏn-tēl'*), a cluster of islands, forming a half circle and generally called the West Indies. They are about 360 in number. They are very fertile, but fierce hurricanes blow over them, and their climate is very hot. Their chief products are sugar, coffee, tobacco and cotton. They are divided into the Windward Islands, the Leeward Islands and the Great Antilles. See WEST INDIES, CUBA, JAMAICA, BAHAMAS, etc.

**An'timony,** a brittle metal of a bluish-white color. It may easily be reduced to a powder. When heated to about 800° it melts, and when cooled it forms crystals. It burns in the air with a white light, and gives off fumes known as the flowers of antimony. It does not tarnish or rust, and so is much used in alloys, such as type-metal. The finely-divided metal, called *antimony black*, is used to give casts an appearance of iron. There are a number of useful compounds of antimony: tartar emetic, the tartrate which is used in medicine; glass of antimony, a mixture of oxide and sulphide, used for coloring glass and porcelain yellow; and butter of antimony, the chloride, an oily liquid, which, mixed with olive oil, is used by gunmakers to give a brown color to gun barrels. The principal source of the metal is the sulphide, called stibnite or gray antimony ore. It is smelted in France, where it is found abundantly, in Germany and in England which receives its supply from Singapore and Borneo. Antimony is found in America, in California, Nevada, Mexico and New Brunswick.

**Antinous** (*ăn-tin'ō-us*), a beautiful youth of Bithynia. He was a favorite of the Emperor Hadrian, and went with him on his journey through Egypt. An oracle had told the emperor that a great danger which threatened him could be avoided only by the sacrifice of the person whom he loved most fondly. The youth hearing this, drowned himself in the Nile. In his honor, Hadrian built the splendid city of Antinoöpolis or Antinoë, in Egypt, and also gave his name to a newly-observed star. Antinous was made a god, and statues of him were set up throughout the Roman empire.

**Antioch** (*ăn'tĭ-ŏk*), named from its founder, Antiochus, was long celebrated as one of the first cities of the east. The name

Christians was first given to the disciples of Christ in this city. It was captured by the Saracens and the Crusaders. Once richer than Rome itself, but devastated by earthquakes and impoverished by conquests, it was finally razed to the ground by the Mamelukes, in 1269. The "Queen of the East," as it was called, is now only a small town.

**Antipodal Cells** (in plants). A group of cells developed in the embryo-sac of *Angiosperms*. See EMBRYO-SAC.

**Ant-Lion,** the larva of an insect common in the United States and belonging to the order *Neuroptera*. The larva is armed with long jaws. It constructs in the sand a funnel-shaped pit one or two inches across. It then conceals itself at the bottom with its pincer-like jaws protruding into the funnel. Ants and other insects slide into the pitfall and are devoured by the larva. The adult form is a graceful insect with four delicate wings and a slender body.

**Antonel'li** (*ăn'tō-nĕl'lē*), **Cardinal Giacomo,** was born in Italy in 1806, and died at Rome, November 6, 1876. He was raised to the cardinalate in 1847, and was for a time secretary of foreign affairs for the papal states. As a champion of the papal interest, he strenuously opposed the union of Italy, under Victor Emmanuel. He was chief adviser and prime minister of Pope Pius IX, and during the Italian revolution of 1848 he accompanied his Holiness in his flight to the seaport of Gaeta.

**Antoni'nus** (*ăn'tō-nī'nŭs*) **Pi'us,** a Roman emperor, was born in 86 A. D. He was adopted by the Emperor Hadrian and succeeded him in the year 138. His reign was peaceful and prosperous. He is quoted as saying: "I had rather preserve the life of a citizen than destroy a thousand enemies." He encouraged everything that was good, helped the poor, lessened the taxes and well earned the title: "Father of his Country." He was called *Pius* (pious), because he built a temple in honor of his adopted father Hadrian. He died 161 A. D.

**An'tony, Mark,** a great Roman general, was born at Rome in 83 B. C. He fought bravely as a soldier in Syria, Egypt and Gaul under Cæsar, whose firm friend he became. He took part in Cæsar's great victory of Pharsalia, and with him was made consul in 44 B. C. After Cæsar was killed, Antony, with Augustus and Lepidus, formed a government called the Triumvirate, which defeated the republican army of Brutus and Cassius at Philippi. Some time after, Antony visited Greece and Asia, and met the beautiful Cleopatra, queen of Egypt. His love for her made him forget the provinces he was to govern. When at last he turned his attention to them, he ruled so much like a despot that Augustus sent an army against him, which defeated him in the naval battle of Actium, Cleopatra cowardly sailing away with her ships, and Antony too much in love to stay behind her even to fight for his honor. Soon afterward Mark Antony killed himself (30 B. C.).

**An'trim,** a county and town in the northeast of Ireland, noted for its extensive manufactures of linen. The capital of the county,—which, as it was largely colonized from Scotland, is preponderatingly Protestant—is Belfast. Antrim is an old town, with considerable historic interest attached to it. Near it, in the reign of Edward III, a battle was fought between the English and the Irish; and, during the troubles of the year 1798, a British force encountered, at Antrim, a body of rebellious "United Irishmen," and defeated them. The county of Antrim has an area of 1,211 square miles, with a population of 478,603.

**Ant'werp,** the main seaport of Belgium. Its cathedral is a fine specimen of Gothic architecture. The paintings in it are by Rubens; among them is his best work, *The Descent from the Cross*. Antwerp is over a thousand years old. It is to-day the chief military arsenal and the principal commercial city and seaport of the kingdom. The province of the same name (Antwerp or Anvers), has an area of 1,093 square miles, with a population of 825,156. At the beginning of the 16th century the city was at the height of its prosperity, with a population of over 200,000, a world-wide commerce, and having 2,500 ships at a time in its harbor. Its noted citadel was built by the Duke of Alva, and has endured many sieges, especially one of thirteen months by the Duke of Parma. Population, 317,171.

**Apa'ches** (*ă-pă'chāz*), a tribe of Indians that inhabit Arizona, New Mexico and parts of Mexico. They are the most treacherous and bloodthirsty of Indians, and live by hunting and robbery. They have no single chief. By a system of mountain signals they can gather at short notice a large body of warriors.

**Ape,** the name often applied to any monkey, but here confined to the tailless, semi-erect forms that most nearly approach man in structure. This includes the chimpanzee, orang-outang, gorilla and the gibbon. They are all inhabitants of the old world. The term man-like ape applied to these forms is significant of their likeness in structure to man. In fact, man differs structurally from these apes no more than they differ among themselves. It requires some anatomical knowledge to appreciate the differences. Those in the brain are often referred to, but even in that organ it is largely a difference in size, in convolutions and microscopic structure. The convolution containing the brain-cells that preside over speech (convolution of Brocca) is deficient in the apes, and there are, of

course, other differences. The likeness is especially strong in the young animal.

An interesting contribution to the facts bearing on the subject of structural resemblances was the finding of a fossil form more man-like than any previously discovered. In 1894, there was found in the island of Java remains of a fossil ape (*Pithecanthropus erectus*), which, from the capacity and form of the cranium and the anatomy of the long bone of the leg, occupies a position intermediate between man and living apes. The doctrine of evolution does not teach that any existing ape is in the direct line of man's ancestry, but that the simian line and the human line are united in remote generalized ancestors common to both groups. The existing apes are, therefore, side branches, as it were, of the ancestral tree and not in the direct royal line. The apes are progressing in their habits; some of them build rude shelter, use clubs and stones in defense, etc., but a popular misconception should be corrected—their progress is not directly toward humanity, but toward a more perfect simianity. Apes live mainly on vegetable food. They are as large as, or larger than, man; all can walk as man does, though more at home in climbing. They have no tail and no cheek pouches, have great strength and intelligence. They are by nature very savage, and are among the most dangerous of wild animals. See CHIMPANZEE, ORANG-OUTANG, GORILLA.

**Apelles** (*ă-pĕl'ēz*), a Greek painter, who lived probably between 352 and 308 B. C. We do not know when or where he was born, nor when or where he died, and not one of his pictures remains, yet his name stands for the highest excellence in painting. He painted portraits of Philip and Alexander, who would sit to no other painter. His most famous picture was *Venus Rising from the Sea*. One of his paintings, representing Alexander holding a thunderbolt, was sold for a sum equal to $200,000. When he had finished a picture, he used to place it in a public place and hide behind it, to hear what was said. Once he overheard a passing shoemaker say that a slipper on the foot of a figure had not ties enough. Apelles corrected the mistake. The next day the shoemaker began to find fault with a leg, when Apelles, putting out his head, desired him to confine his criticism to the slipper.

**Ap'ennines,** a chain of mountains in Italy, running the whole length of the peninsula, from the Maritime Alps to the Straits of Messina, a distance of 800 miles. Its average height is about 4,200 feet; its highest peak, Monte Corno, is 9,542 feet. Between the main range and the Mediterranean extends a chain called the Sub-Apennines, which include the group of volcanoes of which Mt. Vesuvius is the center.

**Apet'alous Flowers.** The phrase literally means "flowers without petals," but it is somewhat arbitrarily applied. In a complete flower there are two distinguishable floral envelopes—calyx and corolla. In case there is only one floral envelop, it is assumed that the corolla (petals) is missing, and the flower is said to be apetalous. The apetalous condition may be a primitive one, or it may have been derived by reduction from forms which had petals. Apetalous flowers are most common in what are regarded as the more primitive families of *Angiosperms*. The noun form of the word is apetaly.

**Aphides** (*ăf'ĭ-dēz*), small insects very injurious to plants and commonly called plant-lice. The number of species is very large, and they live on a great variety of plants. They are usually greenish in color, with short bodies and long slender legs. Their mouth parts are formed into a short stylet, through which they suck the juices of plants. They prey practically upon all cultivated plants, and increase so rapidly that were it not for their numerous enemies plant life would almost be destroyed. The grapevine phylloxera is very destructive to vineyards; a great pest is the root-louse of the apple, mistakenly called the American blight; another great pest the hop plant louse; and others, the aphides of the cabbage, potato, bean, apple, pear, etc., have carried wide destruction. They are produced in large numbers, and have natural enemies, like the larvæ of the lady-bird. Tobacco and a strong solution of soap and kerosene emulsion are used in combating them.

Many forms of aphide produce a sweet liquid, called honey-dew, of which ants are very fond. Ants are known to keep herds of them as "milch cows" in captivity, protecting them from their enemies and stroking them with their antennæ in order to make them give up the honey-dew.

**Aphrodite** (*ăf-rō-dī'tē*), the Greek goddess of love, the counterpart of Venus in Roman mythology. Both, probably, are of Asiatic origin; though it is to the Greeks that we owe the pretty story of her birth from the sea foam and of her subsequently becoming the wife of Hephæstos and the mother of Cupid. By another account, Aphrodite is said to be the daughter of Jupiter and Dione. Beautiful herself, she was endowed with the power of conferring beauty; and as the queen of beauty she was awarded the golden apple of Paris.

**A'piary,** a house or structure for keeping bees, from the Latin *apis*, a bee. Differences of opinion exist as to the best form hives should take and of what material they should be constructed. Among old-country bee-keepers, the old dome-shaped straw *skep* is still preferred; others prefer a box-like wooden hive, consisting of a breeding-chamber below and two sliding.

removable chambers above for the abstraction of the honey without disturbing the bees. The one essential on which all agree is that the apiary should be erected in the vicinity of good feeding grounds, such as gardens, clover-fields or heath-covered hills. See BEES.

**Apocarpous** (*ăp'ō-kär'pŭs*) **Flowers.** The carpels of a flower may remain distinct from one another and thus form simple pistils, or they may organize together in the formation of a compound pistil. In the former case the flower is apocarpous, in the latter it is syncarpous. An apocarpous condition is regarded as more primitive than a syncarpous one. The noun form of the word is apocarpy.

**Apogamy** (*á-pŏg'ă-my*). In plants with regular alternation of generations (which see) the gametophyte produces the sporophyte by means of a fertilized egg. Occasionally the sporophyte is produced directly upon the gametophyte without the intervention of an egg, and such a phenomenon is known as apogamy. In general, therefore, apogamy refers to the appearance of the embryos of higher plants without any sex act.

**Apollo,** called also Phœbus, one of the chief gods of the Greeks. He was born on the island Delos, and was the son of Jupiter and Latona. He is the god of the sun, the god of song, the head and protector of the muses, the revealer of the future—especially at his temple at Delphi—the god of flocks, the archer who inflicts vengeance with his arrows and the patron of the healing art. He is pictured as a beautiful youth with long hair, his brows bound with the leaves of the sacred bay tree, and bearing the lyre or the bow. The Romans adopted him from the Greeks, and built a temple and held games in his honor.

**Apollo Belvedere** (*bĕl've-dēr*), a marble statue of the god Apollo, one of the most famous works of ancient art. It was found in 1503 in the ruins of ancient Antium and placed in the gallery of the Belvedere in the Vatican at Rome. The sculptor is unknown, but is thought to be one of the Greek sculptors, either Agasias or Praxiteles. The statue is seven feet high and shows the god in the perfection of manly beauty, at the moment of his victory over the monster Python. He stands with his left arm extended, holding the bow, while his right hand, which has just left the string, is near his hip. The body is poised with such grace as to give it a wonderful beauty.

**Apos'pory.** In plants with regular alternation of generations the sporophyte produces the gametophyte by means of asexual spores. Occasionally gametophytes arise directly from sporophytes without the intervention of a spore, and such a phenomenon is known as apospory. Both apogamy and apospory have been most commonly observed in ferns.

**Apostles,** originally the twelve men whom Jesus chose to preach the Gospel. They were Simon Peter (called also Cephas and Bar-jona), Andrew, James the Elder (son of Zebedee), John his brother, Philip, Bartholomew (Nathaniel), Thomas (Didymus), Matthew (Levi), James the Younger (son of Alpheus), Thaddeus, Simon and Judas Iscariot. Matthias was chosen in the place of Judas, and later on Paul and Barnabas were added to the number. The apostles were first sent out by Jesus to preach to the Jews only; but a short time before his ascension they were commanded to preach to all nations. On the day of Pentecost they received miraculous gifts and began their public ministry. They have left records in the *Epistles* and the *Acts of the Apostles*.

**Apothe'cium.** In plants, a flat or cup-like spore-producing body formed by the *Ascomycetes*, which see. The name is most commonly applied among the lichens.

**Appala'chian Mountains.** See ALLEGHANIES.

**Apperception.** This term was originally used by Leibniz (1646–1716), a German philosopher. He wished to distinguish between consciousness and self-consciousness. Ordinary perception makes us aware of external objects, but not of our own perceptions as distinct from what we perceive. Leibniz employed the word apperception to indicate the consciousness of perception. This self-consciousness, he thought, is not possessed by the lower animals, but only by human beings. The brute perceives, man apperceives, or perceives that he perceives. The philosopher Kant (1724–1804) used the term apperception to mean the power of the mind to relate to various perceptions and especially to organize them into a system. The result of apperception, according to him, is that the objects of perception are all seen to belong to one world, to be governed by its laws and thus to be related to each other, and all the perceptions are seen to belong to various minds, by which they are organized, and by the laws of which they are controlled.

Herbart (1776–1841), another German philosopher and psychologist, still further modified the definition of apperception by conceiving it to be the process by which old experience assimilates or gives meaning to new perceptions. This view emphasizes the fact that the character of one's previous experience will determine whether he will be interested in any new object sufficiently to attend to it, that is, to apperceive it. Moreover, the new object that one attends to will seem significant and interesting in accordance with the richness of the experience that he has already acquired in reference to similar objects. Indeed, different people may apperceive the same

thing in very different ways and yet all find it interesting. To illustrate these points, suppose a person in crossing a stream sees what looks like a small dull, yellow stone. It does not differ much from the other stones surrounding it, and if the observer does not know enough about that sort of an object to make it more interesting to him than its neighbors, it will not arrest his attention. Suppose, however, that the observer is a savage, who has noticed such stones before, and that they are unusually heavy, and therefore valuable as missiles, such a person would get from seeing the stone a number of suggestions connected with warfare or the hunting of wild animals, and be sufficiently interested to pick it up and carry it away. But if a civilized man were to perceive that the object is not an ordinary stone, but a nugget of gold, his interest will become intense because of his knowledge of its use as money and in the arts. He will not only pick up the nugget, but will do so eagerly. A great number of ideas will surge into his mind, and it may be some time before he will think of anything except his discovery and its significance. Moreover, his actions will be very extensively modified by the experience. If he happens to be a miner, he may perceive in the nugget the suggestion of a rich deposit of gold in the neighborhood, and the current of his life may be turned by its discovery.

It is evident that apperception means alike to Leibniz, Kant and Herbart the interpreting of perceptions by the mind. Leibniz saw in this a process of reflecting upon and becoming conscious of our perceptions. This is, no doubt, one phase of the process of apperception. Kant noticed that this interpreting of perceptions consists in relating and organizing them, and here, too, is an important part of the truth. Herbart brought out the fact that the relating of experience consists in the suggesting of old experience by new perceptions and that its organization means the interpretation of the new perception by the knowledge thus called up. The active force in apperception is, with Herbart, experience itself, and not, as with Kant, a mind that is thought to organize experiences which are themselves passive.

The consequences on education of this view of Herbart are very important. Learning, *i. e.*, apperception, is commonly regarded as absorbing new facts and organizing them so that they may be useful. According to Kant, the teacher might be supposed to present the facts, but their organization must be left to the activity and inclination or will of the pupil. The Herbartian notion of apperception, on the other hand, makes the teacher responsible in a measure for the activity displayed by the learner in assimilating or interpreting the new experience. For the successful apperception of a new object depends upon two things: first, whether the learner already possesses any experience with which to interpret it; and second, whether the new perception comes in such a way that it calls up this interpreting experience. Both of these conditions the teacher can understand and at least partially control. He can, before he presents a new topic, investigate what the child already knows about it. This will tell him whether the child can apperceive the topic at all and, if so, to what extent and in what way. If the child already possesses a fund of apperceiving material sufficient to make the topic profitable, it may be presented. The method of presentation, however, will depend on what the child already knows. This is brought out in a preparatory step. Such a preparation brings all or the most valuable part of the related experience possessed by the child actively to bear on the new idea, thus insuring its apperception. It also gives the teacher his clue as to what the child can learn, and what he needs to learn in order to complete his view of the subject. Later, as the new subject becomes better mastered, the teacher can suggest the connections between it and other related subjects—thus increasing the degree of organization of material in the pupil's mind. Finally, the ideas thus mastered can be continually revived at the suggestion of the teacher in order to interpret new material or solve new problems. Thus the idea of appreception can have a very decided influence upon this method of instruction.

From the point of view of the course of study also, the notion of apperception is of the greatest importance. For it implies that each subject as a whole be selected with reference to the child's particular stage of development; that it be so graded that the work of every day prepares for the next; and that all the subjects be so correlated that the growing knowledge of each shall constantly redound to the benefit of all.

The idea of apperception has in recent years received a new development because of the discovery that what causes new subjects to be seized and assimilated by the mind is not merely that they are seen to be related to familiar experience, but that their mastery is felt to be worth while. To use the illustration employed earlier, the savage is interested in the nugget and apperceives it, because he sees that he can make use of it in a very fruitful way. The intenser apperception of the civilized man is due to the great value that gold has for him in the social world he inhabits. From this point of view the teacher is seen to

have the task of not merely connecting the new object with familiar experience but also that of helping the child to see how, in the light of his experience, the comprehension of the new topic is worth while. To get the observer to apperceive the nugget properly, it may not only be necessary to tell him that it is that familiar thing, gold, but to get him to see how valuable a thing it is to know about and to possess. To be sure, experience would be the only source of this valuation. Yet the child may need help to get from experience the values that will inspire him to enlarge his experience and power along specific lines. Thus, through a proper utilization of his experience the savage might be led to see the value that gold has for civilization and so to apperceive it quite differently. In this aspect apperception is very intimately related to *Interest*.

Some psychologists now use the term apperception to cover all that the mind adds to what is at the moment given by the senses. In this meaning it signifies the interpretation by the mind, not of perception, but rather of sensation. Perception itself is a gradual outgrowth of experience and therefore involves apperception. This use of the term leads to no important educational consequences that are not involved in the other.

See ASSOCIATION OF IDEAS, INTEREST, TEACHING, METHOD OF, MENTAL DISCIPLINE, PSYCHOLOGY FOR TEACHERS.

Consult *Apperception*, Lange; *General Method* and *Method of the Recitation*, McMurry; *The Educative Process*, Bagley; and *The Point of Contact in Teaching*, Du Bois. E. N. HENDERSON.

**Appian Way,** a famous road with many branches which connected Rome with southern Italy. The main road was laid out by Appius Claudius (312–307 B. C.). It was paved with large and well-fitting blocks and adorned with numerous magnificent sepulchers, the most noted being those of Collatinus and the Scipios. Within the present century excavations have been made over a large part of the ancient road.

CONSTRUCTION OF PORTION OF APPIAN WAY

**Apple,** the name of a tree and of the king of fruits, the most important commercial pomological fruit in the world. It will grow in a variety of climates and soils; in the Old World its range is from Scandinavia south to the mountainous portions of Spain; in the New World, from New Brunswick to the mountains of Georgia, from British Columbia down to the mountains of Mexico. And in New Zealand and Tasmania the apple thrives. It has been in cultivation since prehistoric times. Notable reference is made to it in ancient literature; it is mentioned several times in the Bible; in the tale of Troy's fall the apple played a part; names and other evidence shows its extensive cultivation by the Romans; the folk-lore of Scandinavia and Germany abounds with stories of apple trees and golden apples.

The apple belongs to the rose family of plants, and is a native of southwestern Asia and adjacent Europe. The common apples are all modifications of a single species; while the crab apples have all been derived from another species. The number of varieties actually on sale in America during any year is not far from 1,000. North America is the greatest apple country of the world, and a full crop for the United States and Canada is said to be not less than 100,000,000 barrels.

Apples were early introduced in this country, and at first prized specially for cider. In the United States the apple is adapted to all portions save Florida, the lands immediately bordering the Gulf and the warmer localities of the southwest and Pacific coast. The most perfect apple region, Bailey considers, begins with Nova Scotia and extends to the west and southwest to Lake Michigan; other important regions are the Piedmont country of Virginia and the highlands of adjacent states, the plains region, the Ozark and Arkansas regions and the Pacific region.

While the apple thrives in a variety of soils, it reaches its best in a clay-loam. It is propagated both by budding and by grafting the sort desired on young seedling trees. Apples grown from seeds are very apt to revert to the wild type. Dread enemies of the apple are apple worm and apple scab. Spraying with poison is the means used to check their work of ruin.

There are several species of crab apple native to North America; the prairie, the wild (*Coronaria*), the narrow-leaved, and the oregon crab. The blossom of the wild crab-apple is of exquisite beauty and fragrance, and thickets of these trees now have place in many of our city parks. There is no wild flower more highly prized in this country, and for every region there is a crab-apple tree.

The common apple tree is rightly valued for its beauty as well as its utility. In the spring, when the rugged, sturdy trunk bears aloft its huge bouquet of fragrant bloom and freshest leaves, all pay homage—and here may be made declaration that

beauty is excuse for the wealth of flowers, for not one tenth of the blossoms is needed to "set" all the fruit the tree could mature. A summer orchard, too, is very attractive, and decidedly attractive is the orchard in the season of ripened fruit. In winter the spreading bare branches and leaning tree stand out in full picturesqueness.

"Health to thee, good apple-tree,
Well to bear pocketfulls, hatfulls,
Peckfulls, bushel-bagfulls."

See Bailey's *Cyclopedia of American Horticulture* and Bailey's *Field Notes on Apple Culture;* Thomas: *The Book of the Apple;* McFarland: *Apples.*

**Appleseed, Johnny,** the nickname of an eccentric character belonging to the early pioneer days of Ohio and Indiana. He looked upon it as his mission in life to start orchards in the wilds, and for over 40 years trudged here and there in the wilderness with his leathern bag of apple seeds. His clothing in later life consisted of a long, loose garment made out of a coffee sack, on his head a cap fashioned of pasteboard. He wore no shoes, but trod barefoot on his long, rough journeys.

His real name was Jonathan Chapman; it is thought he was born in Boston in 1775. He made his appearance in Ohio with his apple seeds in 1801; came again in 1806, this one time travelling by water, his seeds stored in canoes. Ere long he became well known to the settlers and Indians, and was regarded as a friend by both. He would procure his seeds from the cider-presses of western Pennsylvania, then with his load go where the white men were clearing and making homes farther west; selecting a fertile spot near a settlement, he would start a nursery, and when ready for transplanting dispose of his trees to the settlers. Ohio and Indiana owed to Johnny Appleseed many and many a good orchard; he lived to see his trees bear fruit over a territory of great extent.

At the scattered log-cabins old and young were wont to give warm welcome to the strange, kindly wanderer. He seems to have been held in a kind of superstitious awe, the Indians for their part considering him a great medicine-man. During the War of 1812 he saved the lives of many settlers by spreading the news of Hull's surrender and the coming of the Indians. He was extraordinarily gentle and kindly, would harm no living creature, and amid the many dangers of the forest himself remained unharmed. He died at a settler's cabin in Allen County, Indiana, in the summer of 1847.

**Appleton, Wis.,** a city, the capital of Outagamie County, Wisconsin, on the Fox River, about midway between Oshkosh and Green Bay city. The town receives its water-power from the falls here on the Fox River, and utilizes this in the chief factories and industries, such as in pulp-making, paper making, the manufacture of pulp-mill machinery, furniture and woolen goods. Other industries are flour and wind mills, wire works and cement building-blocks. The town has a water outlet by river into Green Bay and Lake Michigan, as well as by rail, 120 miles southeast to Milwaukee and other points. It is the seat of Lawrence College, has two fine libraries, one public and the other in Lawrence College, and a handsome Y. M. C. A. building; also a fine hospital in charge of the Catholic sisters. Population, 16,773.

**Appomat'tox Courthouse,** a Virginia village, 20 miles east of Lynchburg. Here, April 9, 1865, General Lee surrendered the army of northern Virginia to General Grant. Of this army only 27,805 men were left.

**Apricot** (*ā'pri-cot*), a fruit between the peach and the plum, supposed to be a native of China. There are three species. The kind common in Europe and America grows on a spreading tree with round top, luxuriant, beautiful foliage, bark similar to that of the peach, leaves bright green and ovate or round-ovate, flowers of pinkish white. The apricot will grow under much the same general conditions as the peach. It is beginning to be grown commercially in the east, but it is in California it holds leading place. It has been grown there since the early mission-days, and now is one of California's most important commercial fruits. In the east the apricot suffers from the curculio, the insect that works such havoc with peach and plum. In California the enemies feared are scale insects and a slot-hole fungus.

**A'pril,** the fourth month of the year, containing 30 days. It is named from a Latin word, meaning "to open," because the buds open at this period of the year. Charlemagne, who made a new calendar, called it Grass Month, the name still given it by the Dutch. On old monuments April is represented by a dancing boy with a rattle.

**April Fools' Day,** the first day of April. The custom of playing tricks and practical jokes on this day is common throughout Europe and America. In France, the man tricked is called a "silly fish;" in Scotland a "gowk." This practice probably goes back to the era of the early Hindus who play the same kind of tricks on the last day of March, when they hold what is called the Huli festival.

**Aquarium** (*á-kwā'rĭ-um*), a tank for keeping living animals and plants for study and amusement. A proper proportion of plants and animals keeps the water pure, or it may be renewed. There are two kinds, fresh water and marine aquariums. The fresh water ones are more easily kept, as the animals are hardier. A good form is a square tank, about 12 inches deep, with

plate glass sides, and metal, slate or marble bottom and a metal frame. The bottom should be covered an inch deep, or more with sand and pebbles scattered over it, and the tank filled with fresh river or spring water. The use of rock work adds greatly to the beauty. Among plants, water thyme, crowfoot, milfoil and starwort, are useful, because they produce a great deal of oxygen. Interesting animals for this purpose are the stickleback, goldfish, tench, gudgeon, perch, minnow and Prussian carp; while mussels and snails are good as purifiers. A salt-water aquarium needs more careful attention, but is built in much the same way. Another form, with three of the sides closed and with an inclined plane for a floor, to allow the more torpid animals easily to reach the surface, has been found very successful. Green dulse or seaweed is a good sea-plant to use, and of animals, shrimps, snails, barnacles, minnows and sticklebacks. Large aquariums have been built in many cities. One of the largest is the English one at Sydenham near London.

**Aqueduct** (*ăk'wē-dŭkt*), a channel for carrying water, or a structure on which water-pipes are laid. This method of carrying water has been in use from the earliest times. Persia, Phoenicia, Judæa and many other eastern countries practiced it; while the Incas or rulers of Peru in the western world built aqueducts which have not been equaled in ancient or modern times. The Romans were the most expert at aqueduct building of ancient peoples and built these works all over their dominions. Rome was supplied by 24 aqueducts, some with several channels, one above another, extending many miles. They are built on a grade of regular descent, winding around the hills or piercing them by tunnels and supported across low levels by arches sometimes over a hundred feet high. Many cities are now supplied with water by this means.

Other important aqueducts are those used for carrying canals across rivers and valleys. The chief examples in the United States are those on the Erie canal, 32 in number, the Denver aqueduct, of wood, which supplies 16,000,000 gallons a day, the Pioneer aqueduct in Utah, and the new Croton aqueduct in New York, which cost over $20,000,000, and required over five years to build.

California has many wooden aqueducts, called flumes, for use in hydraulic mining. Masonry and iron piping are both extensively used for aqueducts, the choice depending upon the contour of the land. As cast iron does not become corroded so quickly as steel, it is more often used, though steel can sustain a greater amount of pressure from within. Concrete is used when the ground is high and the water is to be carried on or near the surface, and when a great volume of water has to be transported.

**Aquinas** (*ă-kwī'năs*), **Thomas** (c. 1225-1274), was the greatest of the Christian philosophers of the Middle Ages. He is known as "the angelical doctor" and "the universal doctor." Aquinas, so called because of his birthplace Aquino, in Italy, was a member of the order of Black Friars. His chief work is the *Summa Theologiæ*. His writings were regarded by his followers as almost sacred; and in 1323 he was canonised as Saint Thomas Aquinas. Although he knew little of history and nothing of Hebrew and Greek, the learning of Aquinas was as extensive as was possible previous to the Renaissance. In the 14th century scholars became divided into two great bodies, the Thomists or followers of Aquinas and the Scotists or the followers of the Franciscan writer, Duns Scotus. The doctrines of Aquinas somewhat resemble those of Aristotle, who was known in part to Aquinas in translation, and those of the Scotists are indebted to Plato. The great work of Aquinas was his attempt to bring together scientific learning and Christian doctrine into one complete system.

**Ara'bia,** an extensive quadrangular peninsula forming the extreme southwest part of Asia, much of the interior of which is an arid, sandy desert. It is situated between 12° 40′ and 34° north latitude and between 32° 30′ and 59° 40′ east longitude.

*Area.* Its length, from north to south, is about 1,500 miles, and its breadth from east to west varies from 800 to 1,200 miles. It is bounded on the south by the Gulf of Aden, the Arabian Sea and Indian Ocean; on the east by the Gulf of Oman and the Persian Gulf, the Tigris River in the northeast separating it from Persia; while its northern boundary is Asiatic Turkey; and its western the Red Sea and Strait of Bab-el-Mandeb. The Sinaitic Peninsula and the Suez Canal on the extreme northwest separate Arabia from Egypt and the continent of Africa. In the southwest the island and fortified port of Aden and that of Perim both British possessions subject to the Bombay (East Indian) Government form excellent harbors and coaling stations. The other harbors (there are not many on the Arabian Coast) include Muscat on the Gulf of Oman, El Kuweit near the mouth of the Tigris, and Dafar (or Dhofar) near the British Kuria-Muria Islands in the Arabian Sea.

*Government.* The peninsula is politically a dependency of Turkey, and by that power its more settled region, on the Red Sea front, is created into two vilayets or provinces, named Hejas (area, 96,500 square miles, with a population of 300,000) and Yemen (area, 73,800 square miles, with a population estimated at 750,000). In the former (Hejas) the chief port is Jedda, the administrative seat and the

objective point of pilgrims, proceeding from Syria and Egypt on their way to the inland city of Mecca, the birthplace of Mohammed and containing the Kaaba, the holy shrines and sacred mosques of Islam. North of Mecca lies Medina, with its Red Sea port of Yambo. Medina, too, has its fine mosques, one of them being erected on the spot where Mohammed died. The capital of Yemen, is Sanaa, its port being Hodeida on the Red Sea. South of Hodeida, near the Strait of Bab-el-Mandeb, is Mocha, the seat of the coffee trade, which is now chiefly exported from Aden and Hodeida. Inland from these two provinces lies the Syrian desert on the north; and on the south, extending for hundreds of miles from Yeman to Oman, are the deserts of El Akhaf and Roba'a-el-Khali.

*Surface and Products.* Arabia with its extensive tablelands, varied by its vast trackless deserts, has a hot, dry climate, only the coastal plains being fertile and productive. On the latter, browsing on the grassy slopes, are reared donkeys, goats and dromedaries. Besides these, Arabia has many wild animals, the terror of travellers and the menace to the native caravans; among these are tigers, panthers, hyenas and lynxes, besides the less repellant and more useful ostriches and gazelles. Among the natural resources, besides the rice plant, the coffee tree and the date palm, there are many spice and incense shrubs, together with the cotton and maize plants; while gum arabic and precious stones form a considerable portion of the exports.

*History.* The Arabs claim descent from Ishmael, and have ever been a wild and independent people of nomadic habits and predatory instincts. Their history proper begins with the advent of the religious enthusiast, Mahomet (570-632 A. D.), and with the foundation of the caliphate. Leaving their peninsula, the Arabs and their caliphs founded large and powerful empires in three continents, which flourished until the close of the 15th century, when Arab rule and influence in Europe and Asia Minor came to an end. In the following century the Turks obtained possession of Yemen, and, though for a time they were expelled from that Arabian province, they subsequently settled down in the peninsula and obtained at least nominal possession of its holy cities as well as those in the Hejas province. Since then, the one alloy in the Turkish cup was the rise and dominance for a time of the Wahabis, a religious sect which sought control of the Mohammedan holy cities and shrines, and menaced the Sultan's interests in the country as protector of the sanctuaries. The rebellion —which it was—was attempted to be put down, but it took many campaigns from the years 1811 to 1818 before this could be effected by Ibrahim Pasha, acting under Mehemet Ali, Viceroy of Egypt. The Wahabis, despite Turkish sway, still exert a considerable influence in Arabia.

**Arabian Gulf.** See RED SEA.

**Arabian Literature.** See LITERATURE.

**Arabian Sea,** the upper part of the Indian Ocean, situated to the south of Persia and flanked by Arabia on the west and British India on the east. It has two extensions of its waters, northwest by way of the Gulf of Oman into the Persian Gulf, and southwest by way of the Gulf of Aden into the Red Sea. The latter, with its connection with the Mediterranean, through the Gulf of Suez, makes the Arabian Sea a great highway of traffic to Bombay and to Madras and Calcutta in the Bay of Bengal. The eastern inlets of the sea are the Gulfs of Cutch and Cambay in northwestern India, where it receives the waters of the Indus River.

**Ara'bi Pasha'** (*ā-rā'bē pā-shā'*), the leader of the Egyptian rebellion of 1882, was born in Egypt about 1835. His father was a farm laborer. He had no schooling when a boy, but afterward learned to read and write Arabic. He was for 12 years a private soldier in the Egyptian army, then rose to be colonel, minister of war and pasha. Previous to his day a great deal of money had been borrowed, and the Khédive had promised all Egypt to the bondholders. The people, however, refused to pay the taxes. Hence, England and France interfered, and the Khédive was obliged to fill all positions of trust with foreigners. Arabi now proclaimed to the troops that he was inspired by the prophet to undertake a holy mission, the motto of which was, "Egypt for the Egyptians," and he thus became the leader of a great rebellion. A massacre by his forces at Alexandria soon followed. The English came to the help of the Khédive, and their fleet bombarded and dismantled the forts at Alexandria. The war lasted but a few months, Arabi's army being entirely defeated at Tel-el-Kebir, September 13, 1882, by the English under General (now Viscount) Wolseley. Arabi soon after surrendered, and was condemned to death. His sentence, however, was commuted to exile for life, and he was sent to Ceylon. In 1901 his banishment ceased and he was made a pensioner of the British Crown.

**Arachnida.** Scorpions, spiders and mites. See SPIDERS.

**Ar'ago** (*ăr'ă-go*), **Francois Jean Dominique** (born 1786, died 1853). A leading man of science in France during the first half of the 19th century, he was distinguished alike in astronomy and in physics. At the early age of 23, he had acquired a brilliant reputation by three years of strenuous labor and hardship spent in determining the length of the earth's meridian from Dunkirk to Barcelona. In this work he was

assisted by Biot; and from the measures of these two men was computed the distance from the pole to the equator of the earth. Our international standard of length, the *metre*, is one ten-millionth part of this quadrant. In 1809, Arago was appointed to the Paris observatory where he spent the remainder of his life. In 1816 he joined hands with Gay-Lussac in founding the great French journal, *Annales de Chimie et de Physique*. It was about this time that Arago "discovered Fresnel," and made it possible for the latter to carry out his investigations in optics. In this manner Arago, perhaps, did more to establish the wave theory of light than by his own experiments, which, however, were a contribution of no mean order. In 1830, he became director of the Observatory and member of the chamber of deputies. A little later he held, at the same time, the portfolios of minister of war and minister of marine. His lectures on astronomy and his eulogies on deceased members of the Academy of Sciences are models of clearness and elegance. Arago's works are published in 17 octavo volumes. The first of these opens with his *Histoire de ma Jeunesse*, which is already a classic among autobiographies, and should be read by everyone interested in the development of this remarkable man.

**Aragon** (*ăr'ă-gŏn*), an ancient Spanish kingdom, now a district of Spain, embracing the provinces of Huesca, Teruel and Zaragoza (Saragossa), and through which the Ebro and Jalen Rivers flow. It embraces an area of 18,294 square miles, and has a population under a million. It is mountainous, skirted by the Sierras and the highest range of the Pyrenees. Of its many products, the grape and the olive are the finest. Aragon was conquered by the Romans, by the Goths and lastly by the Moors in 714. Later it was governed by its own kings till it became, in 1479, a part of Castile and Leon, by the marriage, in 1469, of Ferdinand and Isabella.

**Araguay** (*ä-rä-gwī'*), an affluent of the Tocantins, an important river of central and northern Brazil, which reaches the Atlantic through the Para River. Total length, including the Tocantins and the Para, 1,900 miles. In the lower reaches of the river, some 200 miles above Para, the navigation is much interrupted by rapids. About 500 miles from its source, the Araguay incloses the island of Santa Anna, about 210 miles long.

**Ar'al, Sea of,** next to the Caspian Sea, the largest inland body of water in Asia. It is 265 miles long by 145 miles broad, and is situated in Asiatic Russia. It receives several rivers, but has no outlet. Its waters are salt. It is a remarkable fact that twice, first in the Greco-Roman period and afterward during the 13th and 14th centuries, the present bed of the Aral is known to have become dry, while its rivers flowed to the Caspian.

**Aram** (*ā'ram*), **Eugene** (born 1704, died 1759), an English felon, born in Yorkshire. He had a good knowledge of a number of languages and became a schoolmaster. A man named Clark disappeared, leaving his debts unpaid, and Aram was tried as his accomplice. It was discovered later that he and another man had killed Clark. Aram made his own defense at his trial, but was convicted and hanged. He is known as the subject of a poem of Hood's and also of one of the novels of Bulwer.

**Arap' ahoes,** a tribe of American Indians who roamed over the country east of the Rocky Mountains; but chiefly inhabiting Indian Territory and Wyoming. The name is said to signify "tattooed people." They were noted robbers and are very cruel. They number about 5,000.

**Ar'arat,** a noted mountain of western Asia. It is on the boundary between Persia, Asiatic Turkey and the Russian possessions. It is called by the Persians Koh-i-nooh, or mountain of Noah. The highest peak is 17,000 feet above the level of the sea, or 14,200 above the level of the plain beneath, and is always capped with snow. It is a volcano, and its last eruption took place in 1840. Here, according to the Bible, the ark of Noah rested after the flood.

**Ar' auca' nia,** the name formerly applied to a part of Chile which is now nearly all included in the provinces of Arauco and Valdivia, lying between the Andes Mountains and the Pacific Ocean. The Araucanians are very warlike, and are so tenacious of their liberty that they maintained their independence for several centuries. They have been much reduced as a nation, and now number only about 50,000. They are humane towards their enemies, and are said to be very hospitable. They are an agricultural people, and give much attention to stock-breeding. In 1861 a French adventurer, Antoine Tounens, was elected king of the Araucanians, but the Chilean government sent him back to France. The Araucanians finally recognized the rule of Chile in 1870.

**Ar'bitra'tion,** a mode of determining and settling, by reference to outside, independent parties, matters in dispute or disagreement, either in commercial or industrial affairs or in the larger questions of political and international controversy. This may be done by representatives willingly chosen by the respective parties to settle the points of disagreement, or by order of a court of law, when decisions have the conclusive effect of legal proceedings. Arbitration is now being largely adopted in private commercial dealings, especially between masters and workmen; while the resort to the expedient has for many years

been employed in cases of international dispute, not involving national honor. (See HAGUE PEACE CONFERENCE.) Arbitration has been successfully employed in settling railroad and labor strikes, wage controversies, lockouts and other industrial troubles. Arbitration in labor disputes took a long step forward in the appointment of the Commission on Industrial Relations by President Wilson under an Act of Congress. The Commission made inquiry into the general conditions of labor, relations between employers and employees, the effect of industrial conditions on public welfare and the like. As one social worker, who helped to secure the Commission, put it: "What we need is more light and less heat." A free copy of its report may be obtained of the Department of Labor.

**Arbor Day,** a day set apart for the planting of trees, generally observed throughout the United States. It has been established also in Great Britain, France, northern and southern Africa and in Japan. Observance of the day may be said to have started April 10, 1872, the state of Nebraska having the honor of the first Arbor Day, and to the Hon. J. Sterling Morton of Nebraska, belongs the credit of suggesting and establishing a tree-planting day. Kansas began tree planting in 1875, Minnesota in 1876, and gradually the other states followed suit.

Now an important feature of Arbor Day is its connection with the public schools. This connection probably began in 1882, when the school children of Cincinnati, Ohio, planted trees in a public park in memory of authors and statesmen. Soon after this, in most of the schools of West Virginia a special day was appointed for tree-planting. While the festival may be considered a national one, it is observed by the several states and territories at widely different times; in the south it may be observed in December, in the north in May. Some states have a fixed date, in others it is appointed by the governor. In addition to the planting of the trees, appropriate exercises mark the day. The various states issue Arbor Day circulars giving suggestions for the celebration. The value of the interest of the school children in Arbor Day is recognized by the United States Forest Service, which sends out circulars treating of its history and observance. It is desired that every child shall learn of the use and value of the tree in the life of the nation.

**Arbutus** (*ar'bu-tus* or *ar-bu'tus*), trailing arbutus, mayflower or ground laurel, belongs to the heath family. It is one of the loveliest of our wealth of wild blossoms. The leaf often presents a time-worn and rusty appearance, but the waxy, pink blossoms are of rare delicate beauty and exquisite fragrance. After the spring rains the new leaves come and snow glossy green, the later sprays the finest specimens of both flower and foliage. It is a shy blossom, does not take kindly to transplanting in cultivated garden, prefers the distant pine woods or sandy beach by pine-wood lake. Frequently in moss, too, the arbutus grows, but in moss of sand rather than loam. It is found from the Maine woods south to Florida, abounds in the northern pine forests of the Middle West and is a familiar and beloved flower of New England. It is a brave little blossom; its buds formed the preceding fall, are all ready to come forth while yet another snow storm may be expected. The plant trails on the ground, and the sun on the sandy soil forces the bloom. A few warm days in early spring are sufficient encouragement, and often after the rosy little faces have shown themselves a snowfall will whiten the ground around them. The poet, Whittier, tells of the joy the weary Pilgrims, after their hard winter, took in this early blossom—which abounds in the vicinity of Plymouth—

"Yet God be praised!" the Pilgrim said,
Who saw the blossoms peer
Above the brown leaves, dry and dead."

The Indians say when there is most moisture the flowers are pinkest, and they do show pallid in a dry season. The stem is prostrate or trailing, some petals quite buried in the sand, no branch high above the ground—one must stoop low to pluck the posies. The flowers grow in clusters, many attached to the woody central stem; they may be gathered in graceful sprays, but by the Indian venders are cut off short and made up into compact little bunches. In gathering the arbutus greediness should be controlled, the plant not uprooted, else, as is the case near the eastern cities, the beautiful blossom will be pushed farther and farther back from town and village, and in the end become extinct.

**Arca'dia,** a mountainous country of ancient Greece, lies in the northwestern part of the Peloponnesus. In the northeast is the great waterfall of the Styx, which the Greeks thought the main river of the infernal regions. Arcadia seems never to have had immigration from other countries, but was always peopled by the same race, noted for their great simplicity of life. Cut off from commerce divided by the mountains into small districts that had very little to do with one another, the rustic ways of the Arcadian seemed awkward and stupid to other Greeks. Their history is made up of wars against the Spartans. They became a part of the Achæan league, and later of the Roman province of Achaia. Sir Philip Sidney's *Arcadia* greatly praises the Arcadians.

**Arch, Triumphal,** was a memorial raised by the Romans to celebrate a victory or

in honor of a victorious general. When a general came back from battle, the gate by which he entered Rome was wont to be adorned with the spoils of war. This custom grew into that of raising a special arch of bronze or stone, patterned after a city gate. The most remarkable of these arches still remaining are the arch of Augustus at Rimini, the arch of Trajan at Beneventum and the arches of Constantine and Titus at Rome. The arch of Titus was built by the Roman people after his death, in honor of his conquest of Judæa, and is remarkable for its bas-reliefs. The finest modern arch is the Arc de Triomphe, built by Napoleon I at Paris. It has three arches, and is 160 feet high and 150 feet long.

**Archæology** (*är'kē-ŏl'ō-jy*), the science which deduces knowledge of past times in the history of the human race from the relics of bygone ages and the study of existing remains. Exploration in the seats of ancient civilization in the old world and the new has greatly enriched our knowledge of past modes of living and the artistic habits of nations and peoples. In this work the researches and published records of the various archæological societies have been very helpful and instructive, particularly in Mycenæ, Athens, Corinth and Rome, in Assyria, Mesopotamia, Egypt and Palestine, as well as in notable places in ancient Britain, and on this continent in New Mexico, Arizona, Yucatan and Peru. Nor is it only in these regions that antiquities have been recovered; almost every state in the American Union has contributed of its ancient treasure, and not alone from the sites where abode ancient cave dwellers and mound builders, but from the seats of early civilization in North, South and Central America, as well as from almost every region in the old world, where at periods there was a more or less prevalent high art, despite the current estimate of what is deemed a primitive age. The recovered treasure revealing to our modern gaze the cunning handicraft and artistic taste of these early peoples embraces a wide and curious variety, including not only remarkable specimens of the sculptor's and metal-worker's activities, beautiful marbles, mural paintings and costly decorations from Greek and East Indian mausoleums and temples, rare ceramics, mosaics, vases, gems, bas-reliefs, statuary, bronzes and coin mintings, but a vast array of personal ornaments, together with unique household utensils and the more homely, but often elaborate figured pottery and relief ware. Our art galleries, museums and archaeological institutes today are full of the spoil of early days, drawn from the recovered art treasures of the Graeco-Roman world, from ancient Babylonia, Assyria, Phoenicia, Persia, Egypt, Ceylon, India, China and Japan, together with specimens of Anglo-Saxon art and of the tools, implements, weapons and mural remains from our own continent. For details of this interesting subject of archæology, see the many works (chiefly English and German) treating of the science, and the archaeological records of the various lands, nations and peoples, with an account of their early ethnological eras.

**Archangel** (*ark-ān'jĕl*), a Russian city on the River Dvina, 750 miles northeast of St. Petersburg. It has a large trade in timber, tallow and tar; it is connected with the interior by river and canal. Population, 35,000. An English sailor, driven ashore by a storm, once took refuge in a monastery on the site of Archangel. As the result of his visit, an English factory was started there in 1584. For a long time Archangel was the only seaport of Russia, and became very prosperous. It still has a very large import and coast trade. The shortest day here is only three hours and twelve minutes in length, the longest is twenty-one hours and forty-eight minutes. Archangel also is a province of northern Russia; area, 326,063 square miles; population, 437,800.

**Ar'chego'nium.** The female organ of certain groups of plants, namely, the *Bryophytes* (mosses, etc.), the *Pteridophytes* (ferns, etc.), and the gymnosperms (pines, etc.). In general it is a flask-shaped structure. In the bulbous part of the flask the solitary egg is developed; while through the open and often elongated neck the sperms pass for fertilization. So characteristic is this organ that the three groups which possess it are often classed together under the name *Archegoniates*.

ARCHEGONIUM OF MOSS

**Ar'chespo'rium.** In plants a developing spore-vessel sets apart certain cells from all others to produce the spores. The first cells which can be distinguished in this way, and which give rise to all of the tissues which produce spores, are known collectively as the archesporium. The archesporium is a prominent feature in the history of the sporangia of all higher groups of plants.

**Arch'ibald, Hon. A. G.,** born in Truro, Nova Scotia, in 1814. A member of the

executive council as attorney general of Nova Scotia in 1856 and again in 1860. A delegate to England to arrange terms of settlement with the British government as to Nova Scotia mines, and to learn the views of the British government on the question of union of the provinces. Also attended the final conference in London to complete terms of union (1866–7). In 1867 Secretary of State for the provinces. Lieutenant Governor of Manitoba in 1870–3. From 1873 to 1883 Lieutenant Governor of Nova Scotia. A Director of the Canadian Pacific Railway. Styled one of the Fathers of Confederation.

**Archimedes** (*ăr-kĭ-mē'dēz*), a Grecian engineer, physicist, and mathematician, born at Syracuse, on the island of Sicily, about the year 287 B. C. What little is known concerning the details of his life is contained in the histories of Polybius, Plutarch and Livy and in the treatise on architecture by Vitruvius.

Like many men of science belonging to this period, he was educated at Alexandria.

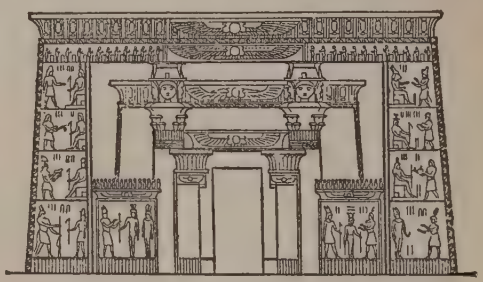
His principal contributions to learning are (1) a large number of geometrical theorems; (2) a short treatise on arithmetic called *Psammites*, because grains of sand were used in the computations; (3) a determination of the centers of gravity in bodies of various shapes, a work which may be fairly called the foundation of modern statics; (4) a treatise on floating bodies; (5) in addition to the above, it is probable that he invented the screw which goes by his name and that he devised a hydrometer by which he could compare the densities of liquids.

Many stories have come down to us concerning his engineering feats at Syracuse while that city was besieged by the Romans during the second Punic War. Most of these stories are not well authenticated.

The best known perhaps is that told by Vitruvius. Having been assigned the problem of determining whether a certain crown supposed to be made of pure gold had been alloyed with silver, he devised the following method: First he measured the volume of a mass of gold just equal to the mass of the crown. This he did by putting the gold in a vessel of water and measuring the overflow. The second step was to measure, in the same way, the volume of a mass of silver just equal to the mass of the crown. Lastly he measured the volume of the crown which proved to be intermediate between that of the gold and that of the silver. From these data it was a simple matter to compute the percentage of silver in the crown. This method, it is said, suggested itself to him as he was getting into his bath, where he observed that the rise of water on the sides of the tub was apparently proportional to the volume of his body immersed.

The story goes on to relate that Archimedes announced this discovery by running through the streets, clothed principally with enthusiasm, and shouting "Eureka! Eureka!" (I have found it.)

**Architecture** (*ăr'kĭ-tĕk'tūr*), is the art of building. All the different styles of constructing and decorating buildings can be traced back to two early forms, used according as the material was either wood or stone. The form used for wooden buildings was two upright pillars and a crossbeam at the top. The arch with its strong abutments was the form generally used for stone buildings. The oldest architectural remains are those of the Egyptians. They are rough and stiff, and show that men had only begun to think about the rules of building and to ask what makes any structure beautiful. The most noticeable features in Egyptian buildings are their immense size and their simplicity and regular outline. How the immense blocks of stone used in them were moved and raised to their place is a cause of wonder today. Most of the temple remains are in Upper Egypt, though



EGYPTIAN—FRONT OF TEMPLE OF ISIS AT PHILÆ

the greater part of them were destroyed by the Persians in 500 B. C. The walls and pillars were usually ornamented with hieroglyphics and with outlines of different sorts; but they had little of the grace and elegance of the later Greek architects. Besides the temples, the most interesting structures are the pyramids, which are supposed to be the tombs of Egyptian kings. They are built of immense blocks of stone put together in regular form, gradually narrowing from the broad base to the small-pointed apex. The largest of them is 693 feet square at the base and 498 feet high. Herodotus states that it was built by Cheops, who kept one hundred thousand men working on it for twenty-years. The obelisks are single four-cornered shafts of great height, usually of red granite and commonly cut from the quarry in a single block. They were placed at the entrances of temples or palaces, covered with hieroglyphics and figures illustrating the victories and great deeds of their kings.

Rameses II.

# How Sculpture and Painting Grew Out of Architecture

WHY did the Egyptian sculptor attach that curious block of stone to his statue of Rameses II? The question long puzzled Egyptian scholars. Finally they found the answer in comparing Egyptian statues with the carvings on the temples and tombs. The earlier sculptors, you see, simply cut the figure into the stone. In the course of time came the next step—the figure stood out from the wall. Then followed the idea of a figure entirely independent of the wall. But among Orientals, where custom is sacred, they felt it to be wrong to make figures without *some* reminder of the wall —hence those curious and apparently meaningless blocks of stone. Notice in the figures from Notre Dame in Paris how Christian sculptors again connected sculptured figures with temple walls.

Rameses and Family

Thoth Presenting Symbol of Everlasting Life to King Seti

Wall Decoration from Notre Dame, Paris

The first paintings were also made upon walls, as in this wall painting from Herculaneum, "Telephus Nursed by the Hind," now in the National Museum at Naples. On the right, in the painting by the English artist, Poynter, "Egyptian Girl Feeding the Sacred Ibis," you can see the whole story of the relation between architecture, painting and sculpture epitomized.

Early Wall Decoration

Feeding the Sacred Ibis

# Studies in Architecture

The Parthenon

Doric Ionic Corinthian

The Three Types of Greek Capitals

THIS picture group shows the Parthenon, the most famous piece of architecture in the world; the altar of St. Mark's, the classic type of Byzantine

Basilica of St. Mark's, Showing Altar

architecture; two types of medieval architecture—the wonderful cathedrals at Rheims and Cologne—and a brilliant example of modern architecture, the interior of the $5,000,000 Grand Opera House in Paris on the opening night.

Original in the Luxembourg, Paris

Inauguration of the Grand Opera House. Painting by Edouard Detaille (French b. 1848)

Notre Dame Cathedral of Rheims, France

Cologne Cathedral, Germany

In Assyria and Persia are found the ruins of great palaces; among the oldest is the northwest palace of Nimrod, built about 884 B. C. A palace at Susa, Persia, was

ROMANESQUE—CATHEDRAL OF WORMS

evidently built of brick and faced with colors in enamel. The Greeks are thought to have taken some of their ideas in building from Assyria and Persia. But it is in Greece that we find the greatest number and most perfect specimens of ancient architecture. The temples and theaters of Asia Minor and Greece were of great magnificence and wonderful for their grace and delicacy of outline. (See ATHENS.)

There are three styles of Grecian architecture, called the Doric, the Ionic and the Corinthian, the most important difference being in the head or capital, as it is called, of the pillar. The most flourishing period of Greek architecture was from 650 to 324 B. C.

The Romans borrowed mainly from the Greeks, but used their architecture not only

GRECIAN DORIC—TEMPLE OF JUPITER AT OLYMPIA

upon temples and theaters, but on many other kinds of buildings, such as baths, bridges, aqueducts, triumphal arches and private houses. They borrowed the round arch from the Etruscans, and soon made use of its principle to construct immense circular domes or vaults. Many great Roman buildings still remain. When Byzantium became the capital of the Roman empire, Roman architecture was in use there. The dome was specially affected by the Byzantines. In the reign of Constantine the Christians were allowed to build churches, and the term Byzantine designates the architecture of the Christian churches of eastern Europe and Asia Minor of that period. One of the finest of these churches is that of St. Sophia at Constantinople.

Romanesque is the name given to the various round-arched styles which arose in Europe after the inroads of the northern barbarians. The Saxon style of building was rude and simple. It was followed in England by the Norman, which is distinguished by the rich and odd carving on the doorways and arches. Most of the best-known buildings in England and Scotland belong to this style. The Gothic or pointed style followed, with its three periods. In the first we find the narrow, pointed windows and high gables and roofs. A part of Westminster Abbey is built in this style. In the second period, the windows are divided into small panes, the upper part filled with beautiful tracery in waving lines. The third period is called the perpendicular period. The tracery is no longer in wavy, but in straight, lines. The doorways have square tops over pointed arches. Westminster Hall in London is a good example of this style, which lasted from the end of the 14th to the middle of the 16th century. At the time of the great revival of learning in Italy, in the 15th century, the old Roman style of architecture, in a slightly altered form, was revived. This style is called the Italian Renaissance. St. Peter's at Rome and the Louvre and the Tuileries at Paris are good examples of it.

Another style of building is the Moorish or Saracenic, which dates back to the 9th century. It is noted for its graceful towers, beautiful domes, the slender pillars which support the walls and for the frequent use of the arch. The Moorish palace of the Alhambra well illustrates this style.

Modern architecture is the name employed for all varieties of building in use since the Renaissance. In the 18th century Greek forms were copied, and in the 19th century the Gothic form was popular. All modern architecture is in imitation of the older forms. Churches are largely imitations of the Gothic, while private buildings are of the Renaissance type.

**Arcot** (*ăr-kŏt'*), a city of Hindustan, once the capital of the Carnatic, is situated on the Palar, about 70 miles southwest of Madras. In it are many ruins, among them the palace of its princes, who were called

nabobs. The people are, in the main, Mohammedans. Arcot was taken by Clive in 1751, in the wars with the French, and finally became a British city in 1801. Population, 12,000.

**Arctic Circle,** one of the smaller circles of the globe, is twenty-three and a half degrees from the North Pole.

**Arctic Exploration.** See POLAR EXPLORATION.

**Arctic Ocean** is that part of the ocean within the Arctic Circle. The main rivers flowing into it are the Mackenzie and Black in America, the Obi, Yenesei and Lena in Asia. Its largest islands are Spitzbergen, Wongatz and Nova Zembla in Europe, those of New Siberia in Asia and the Polar archipelago in America. An expanse of ice of nearly 4,000,000 square miles extends during an eight-months' winter round the pole, and even in summer the temperature is still at the freezing point. From this region come the icebergs which in spring and summer drift into the Atlantic. In the last three hundred years many voyages have been made to make discoveries in this region or to find a passage through it, but we know almost nothing about it. Besides the great dangers of ice, the sailor, often blinded by fogs and snow, has to face without guide or sea-room, storms, tides and currents of unknown waters. The highest point ever reached was by Lieutenant Peary, who in 1906 reached a point 206 miles distant from the north pole. See POLAR EXPLORATION.

**Ardmore, Oklahoma,** a city on the Gulf, Colorado and Santa Fe and Choctaw, Oklahoma and Gulf railroads. About 20 miles north of the Red River. It is the seat of Hargrove College. Its commercial activities embrace cotton, coal and asphalt. Population, 10,462.

**Areop'agus** (*ă-rē-ŏp'a-gŭs*), the hill of Ares or Mars in ancient Athens, near the Acropolis. It was the seat of the court called by the same name, which was the most famous court in Greece. It dates back to the earliest days of Athens, and plays an important part in its history. At first it was a criminal court, but Solon gave it so much power that it reached everything in the state. Pericles took away most of its power; but its fame lived on, even as late as the era of the Emperor Theodosius. Its members were the men who had been archons, or highest officers, in Athens, and they served for life. Here Paul made his address to the Athenians, as given in *Acts*.

**Arequipa** (*ä'rā-kē'pā*). A department in the South American republic of Peru. It lies in the southern part of the republic, between Lake Titicaca and the Pacific. Its area is 21,947 square miles, with a population of 229,007. Its capital is the city of Arequipa which lies in a fertile valley near the volcano of Misti (sometimes called Arequipa), which rises to a height of 20,260 feet. Notable buildings are the cathedral, public library, hospital, astronomical and meteorological observatories. The meteorological station is 16,280 feet above sea level, the highest in the world. Its exports include (besides minerals) cotton, coffee, hides, rice, cocaine, wool and sugar. The province, being on the Andean range, is mountainous. A railway connects it with Mollendo, its port on the Pacific, while a line connects it eastward with Puno on Lake Titicaca. Population, 35,000.

**Argentine Republic** is, next to Brazil, the largest of the political divisions of South America, and with Chile on the west occupies the southern part of the continent. It has an area of 1,135,840 square miles, a little more than one seventh of the area of the continent and one third that of Brazil. It extends from the 27th to the 57th parallel of latitude, a distance as great as from Hudson Bay to the southern limit of Florida. The northern half has an average width of about eight hundred miles and the southern part narrows to about two hundred miles. It could be divided into twenty-two states each the size of New York. Its population is 6,489,023.

*Surface.* In the northern part of Argentine is the basin of the Parana River. Here are large tracts of prairie or pampas, producing wheat and pasturage, with rich cultivated districts near the Parana and Paraguay Rivers and sugar lands and timber tracts further north. In the central section are the great pampas or plains, extending from the mountain range on the west to the Atlantic on the east. The soil is very rich, from three to six feet in depth, and here are the great wheat fields and cattle ranges for which the republic is famous. In the southern section are wide sandy plains, once the bed of an ocean which extended to the Andes. South of the Strait of Magellan is the island of Terra del Fuego, a part of which belongs to Argentine. The republic may be characterized as a country of vast plains, yet in its western border rises the great Andean mountain range, which here shows its loftiest peaks, including Aconcagua 22,860 feet, the highest mountain in America; Mercedario 22,315 feet; Tupangato 20,280 feet; San Juan 20,020 feet.

*Rivers.* The Plata River, on which Buenos Ayres, the capital of the republic, is situated, receives the waters of 10,000 miles of waterways, the second largest river system in the world, and discharges into the Atlantic Ocean a volume of water nearly double that discharged by the Mississippi into the Gulf of Mexico. The Plata is formed by the junction of the Parana and Uruguay Rivers. It is 200

miles long and from 35 to 40 miles wide. The Parana is over 2,500 miles long and in many places 25 miles wide. It is navigable for vessels of 19 feet draught to Rosario, a port 380 miles from the sea, and some of its branches are navigable for vessels of 8 feet draught to points over 2,000 miles inland. By this river system not only all of northern Argentine, but parts of Brazil, Uruguay, Paraguay and Bolivia are made accessible to Buenos Ayres. South of the Plata are a number of rivers of minor importance emptying into the Atlantic. There are 12,274 miles of railway in Argentine. Trunk lines connect Buenos Ayres, which is the center of the system, with all parts of the country.

*Cities.* The chief ports of Argentine are Buenos Ayres, the capital, population 1,319,747; Rosario in province of Santa Fe, population 176,076; Bahia Blanca in the province of Buenos Ayres, population 50,138; La Plata 100,608 and Santa Fe 48,600. The chief interior cities are Cordoba, population, 70,380; Tucuman, population 74,865; Mendoza, population 42,496. Other towns of considerable importance are Salta, population 23,284; Corrientes, population 23,904; Santiago, population 14,340; Gualeguacha, population 13,000; Rio Cuarto, population 12,000; San Juan, population 15,262; and Jujuy, population 10,000.

*Resources.* The resources of the Argentine Republic are largely agricultural and pastoral. Its vast area of fertile territory, its varied climate suitable to the growth of every product of the temperate zone and the tropics, its great rivers and a sea coast 1,500 miles in extent, giving ample transportation facilities, together present conditions which must make this one of the great producing nations of the world. The area at present under cultivation, about 47,000,000 acres, is less than a fifth of the area available for agriculture. By the latest census the wealth of the nation is invested as follows: transportation, $511,588,527; stockraising, $336,546,748; trade, $300,696,958; manufactures, $145,407,647; agriculture, $139,352,746. Minerals of many kinds are found, including gold, silver, copper, lead, tin, iron and coal, but these resources are mostly undeveloped. There are considerable areas of valuable forests. Imports in 1909, $302,756,095; exports, $397,350,528.

*Government.* Argentine is a republic composed of a federal district, 14 provinces and 10 territories. Its constitution is modeled after that of the United States. The president is elected for a term of six years by an electoral college. There is a national congress, consisting of a senate and a chamber of deputies. Each province has a governor and a provincial legislature. There are federal and provincial courts similar in powers and functions to the federal and state courts of the United States.

*History.* The first Europeans who visited the country were a party of Spanish explorers in search of a southwest passage to the East Indies. Their leader, with a small company, landed in 1516. They are said to have been treacherously killed and then cooked and eaten in sight of their comrades on board the ships. The first settlement was made by Sebastian Cabot in 1527, in the name of Spain. Other expeditions followed, the main rivers were ascended, forts were built, wars were fought with the Indians, and after a vast expenditure of blood and treasure the Spaniards were finally established in the land. In 1776, Buenos Ayres was made the capital of a vice-royalty. In 1806, when Spain was at war with England, a body of troops landed from a British fleet and captured Buenos Ayres, but it was soon retaken and the English troops were forced to surrender. Two years later an English army of 8,000 again attacked the city. The houses were built with their windows looking on the streets, guarded with strong iron railings, like prison bars, and with their flat roofs filled with defenders, so that each house was a fortress. After suffering terrible slaughter in their march through the streets, the British surrendered. It was these successes against the English that gave the people courage to throw off the yoke of Spain. On the 25th of May, 1810, what was called the provisional government was set up. This is usually held to be the beginning of the independence of the country. The whole of the vice-royalty did not acknowledge the authority of this government. Bolivia, Paraguay and Uruguay made themselves into separate republics. A struggle with Spain followed, lasting till 1824. Since then there have been many civil wars between the leaders of the two political parties, the Unitarians and the Federals.

**Ar'gon,** a gaseous element discovered in 1895 by Lord Rayleigh and Professor Ramsay of England. It exists in the air to the amount of about one per cent. It is somewhat heavier than air. All efforts to make it combine chemically with other elements have failed. In this inertness it differs from every known element except four others recently discovered, called *belium, neon, krypton* and *xenon,* that are associated with it in the air in extremely minute quantities.

**Argonauts** (*ar'gō-nat*), in Greek story, the band of heroes who sailed, before the Trojan war in the ship *Argo,* in search of the golden fleece; Argonauts meaning sailors of the *Argo.* Pelias, king of Iolcus in Thessaly, was warned by an oracle to fear his nephew, Jason, and so, hoping he would be killed, he sent him to capture and bring

home the fleece of the ram which had carried off the brother and sister, Phrixus and Helle, and which Phrixus had sacrificed to Jupiter. Phrixus had nailed the fleece to an oak in the grove of Mars in Colchis, where it was guarded by a sleepless dragon and by fire-breathing bulls. Jason set sail with the principal heroes of Greece, among them Castor and Pollux, Hercules and Orpheus. After various adventures in Lemnos, Mysia and the land of the Bebryces, and after successfully passing between the floating islands of the Symplegades, which were dreaded because of their custom of dashing to pieces whatever came in their way, the Argonauts reached Colchis. The king of Colchis promised Jason the golden fleece if he would yoke the fire-breathing bulls to the plow and sow the dragon's teeth, from which warriors always sprang up to kill the sower. With the aid of Medea, the king's daughter, a powerful enchantress, who had fallen in love with Jason, the latter achieved these tasks. Finding the king plotting against him, he seized the fleece and set sail with Medea and her brother, Absyrtus. When the king pursued them, Medea killed her brother, and throwing his body into the sea, piece by piece, so delayed her father, that the *Argo* escaped, though, because of their crime, they suffered many things on their homeward journey.

**Ar'gos,** an important city of ancient Greece, in Argolis. It was believed to be the oldest city in Greece, dating back as far as 1500 B. C. At the time of the Trojan War it was a famous capital, and from it the Greeks were often called Argives (*ar'jivz*). Before the rise of Sparta, Argos was at the head of a powerful league of Doric cities, but in later Greek history it plays little part. Its site is occupied by a modern town of the same name, which has a population of about 10,000. Here are remains of ancient cyclopean structures, among them a grand amphitheater hewn in the rock and a large aqueduct.

**Argyle** (*är-gīl'*), **George Douglas Campbell,** eighth duke of, was born April 30, 1823, and died April 24, 1900. He held important offices in the English government, and was a liberal in politics. He also wrote valuable religious and scientific works, among them *The Reign of Law*, and *Primeval Man*. His eldest son, the Marquis of Lorne, married the Princess Louise, daughter of the late Queen Victoria. This is the first instance of the marriage of a daughter of a reigning sovereign of England to a subject. The marquis succeeded to the dukedom on the death of his father.

**Argyll, John Douglas Sutherland Campbell,** ninth duke of, long known as Marquis of Lorne, husband of H. R. H. Princess Louise, fourth daughter of the late Queen Victoria, was born in 1845 in London and educated at St. Andrews University and Trinity College, Cambridge. From 1868 to 1878 he represented Argyllshire in Parliament as Liberal member, and later sat for South Manchester. In 1871 he married Princess Louise, and was governor-general of Canada from 1878 to 1883. In 1900 he succeeded to the dukedom of Argyll and has since sat in the House of Peers. His writings include *A Trip to the Tropics*, *Guido and Lita*, *The Psalms Literally Rendered in Verse*, a work on *Imperial Federation* and a *Life of Queen Victoria*.

**Ariad'ne.** See THESEUS.

**Aries** (*ā'ri-ēz*), a northern constellation, known as the ram. It is the first of the twelve signs in the zodiac, which the sun enters at the vernal equinox (March 21). Owing to the precession of the equinoxes, the constellation now is not within the limits of the sign.

**Ari'on,** a poet and musician of Lesbos, Greece, who lived about 625 B. C. He is said to have invented a new form of verse; but all we know of him is the pretty story told of him by the historian Herodotus. Arion had traveled all over the world and gained great fame and a large sum of money by his skill in singing. On the homeward voyage the sight of his treasure roused the cupidity of the sailors, and they decided to kill him. He was told he must either die by his own hand on shipboard or throw himself into the sea. He chose the latter, but first asked leave to sing one last song. The sailors agreed, and Arion, standing on the deck, sang a dirge, accompanying himself on the lyre. He then jumped overboard, but instead of drowning was borne up by a dolphin that had been charmed by the music. The dolphin carried him to the coast, from which he reached home before the ship. He told his story to the prince, who hardly believed him. On the landing of the sailors, they first said that they had left Arion behind; but when they saw him, they quickly confessed and were punished.

**Arios'to, Ludovico,** a famous Italian poet, was born at Reggio near Modena in 1474, the eldest of ten children. As a boy he showed ability and taste in composition, but at the wish of his father he studied law. After a trial of five years he gave up the attempt, and turned to the study of the classics, and devoted himself to literature as a profession. A few lyrical poems gained him as a patron the son of the Duke of Ferrara, and he spent some years in his service. The death of his father left him to support the family, and compelled him to give more time to the service of his patron, but meanwhile he was producing his great poem *Orlando Furioso*, a work at which he toiled for some ten years. Its appearance made him

famous. His patron alone treated the poem with contempt, and soon dismissed Ariosto from his service. The Duke of Ferrara then became his patron, and made him governor of a small district. After three years of successful rule he returned to Ferrara, where he lived till his death in 1533. Besides his great poem, he wrote a number of comedies and satires, and a theater was built for the playing of his pieces. The *Orlando Furioso* still stands in Italy at the head of all poems of chivalry, and has been translated into many languages. The plot is taken from the wars of the time of Charles the Great.

**Aristi'des** (*ăr'is-tī'dēz*), called the Just, was one of the statesmen of Athens, and helped to build up the greatness of his city. At the battle of Marathon, 490 B. C., he was one of the ten generals of the Athenians. He persuaded the others to give up their day of command to Miltiades, who was the most skillful commander. His rival at Athens was Themistocles and the contest between the two leaders grew so bitter, that it was deemed best to exile one of them by vote. When the vote was being taken, a man who did not know Aristides asked him to write for him the name Aristides on the shell which was used as a ballot. "Has he done you any injury?" asked Aristides. "No," was the reply, "but I am tired of hearing him called 'Aristides the Just.'" Aristides was banished for ten years; but in 480, when his country was in great danger from the Persians, he returned on the eve of the battle of Salamis, and helped his rival Themistocles. He also commanded the Athenians at the battle of Platæa. When many of the states decided to form an alliance against Persia, with Athens at its head, Aristides, because of his well-known honesty and fairness, was chosen to make the arrangements and to assess the expenses of the war on the different states. He died so poor about the year 468 B. C. that he was buried at the public cost; but he had done so much for Athens that the government gave his daughters dowries and his son a landed estate.

**Aristophanes** (*ăr-is-tŏf'a-nēz*), the greatest Greek writer of comedies. Little is known of his life, although his writings have made him famous. He was born at Athens, probably about 448 B. C. He began writing when very young, and his first plays were brought out under another name, because he was not old enough to contend for the prize. He wrote, in all, fifty-four comedies, but only eleven have come down to us. *The Knights* and *The Clouds* are among his most admired pieces. Others are *The Wasps*, *The Birds* and *The Frogs*. Aristophanes laughed at everything and everybody, especially at everything new. He liked old Athens, "as it had been in the days of the Persian wars," and thus failed to see the good in men like Socrates. One of his finest plays, *The Clouds*, is a satire against Socrates. His plays have in them specimens of the most beautiful and finished poetry. He died about 380 B. C.

**Aristotle** (*ăr'is-tŏt-l*), the greatest of all the Greek philosophers, was born at Stageira in Thrace, 384 B. C. His father was a physician, and his own early education was in that direction. In his eighteenth year he went to Athens and became the pupil of Plato, who called him the "Intellect of the School." He stayed at Athens twenty years, until the death of Plato, 347 B. C., when he went to Atarneas in Mysia and afterward to Mitylene. In the year 342 B. C., he was invited by Philip, king of Macedon, to educate his son Alexander in Macedonia. When Alexander set out on his expedition to Asia, 334 B. C., Aristotle returned to Athens, where at the age of fifty, he opened a school called the Lyceum, from its nearness to the temple of Apollo Lyceius. His school and pupils were called the Peripatetics, from his habit of walking up and down in the garden while giving his lectures. After the death of Alexander, he was accused of impiety by the party in power. With the fate of Socrates before his eyes, he chose a timely escape and fled to Chalcis in Eubœa, where he died 322 B. C. Many of his writings are lost; of those that remain, his *Logic*, *Rhetoric*, *Poetics* and *Meteorologics* are the most important. He almost created the science of logic and also that of natural science. In philosophy no one can be named whose influence has been greater or more lasting.

**Arithmetic** has been greatly influenced by modern educational thought, the same as other studies. Until very recent years the principal change taking place in the study consisted in a growing willingness to omit topics that had no close relation to our own lives. For instance, topics now wholly omitted or neglected are the surveyor's table, apothecaries' weight and troy weight; G.C.D. and L.C.M. as special topics, complex and compound fractions, except those of a very simple nature; annual interest and most of compound interest; partial payments, except under the United States rule, and with problems involving common amounts, as a principal of $100 with payments like $10 and $25, rather than amounts like $251.42 and $19.79; profit and loss as a special topic; equation of payments; partnership; longitude and time, except problems based on the 15° scheme and a few others; and cube root. The conviction has been growing that there are too many quantitative matters intimately related to our lives to allow time to be spent on others that lack such relationship.

But more recently new topics have been accepted and other older ones have been receiving a new emphasis, according as such topics are intimately concerned with our welfare. For example, new topics or topics newly emphasized are insurance, stocks and bonds, government revenues and expenditures, the banking business and taxes. These are subjects for children studying somewhat advanced arithmetic. But a similar change is also affecting the problems for younger pupils. Problems dealing with actual situations are more and more in demand for all ages of pupils, such as those dealing with farming, fishing, lumbering, mining, manufacturing, transportation of goods, trade and facts of daily interest.

Knowledge of mental processes is insisted upon as heretofore; but insight into the quantitative conditions of social life is also aimed at through the study of arithmetic. The old style of problems began usually with "*if*," being supposed cases, and the pupil was scolded if he worked for the answer. We are now slowly reaching the point where problems are selected for children whose answers are of real interest and, therefore, worth working for; then the children are expected to work for the answer, just as adults always have worked for them. It is the modern doctrine of interest (see INTEREST) that has been greatly influencing teachers here. The increased interest in the problem increases the pupils' concentration of attention, and thus results in a better knowledge of processes and more accurate work in general. It is very difficult for arithmetics to realize this ideal to a great extent, but recent text-books plainly show a movement in this direction. In beginning arithmetic many good teachers make no attempt to follow the Grubé plan, by teaching the four fundamental operations touching one number before considering the next higher number. In fact, many superintendents now make no attempt toward systematic instruction in arithmetic to pupils during the first year of school. The reason for this is that formal instruction in the subject accomplishes little with pupils so young, and they ordinarily have too much formal instruction in other subjects the first school year anyway.

Counting is one of the first kinds of work, such as the counting of objects, "keeping score" in games, etc. Measuring, involving single facts in the table of compound numbers, such as the relation between inch and foot, foot and yard, pint and quart, ounce and pound, etc., simple fractions, such as $\frac{1}{2}$ and $\frac{1}{4}$, and the symbols of $+$, $-$, $\times$, $\div$, may well be taught the first year arithmetic is studied. That is, fractions and various other topics need not be delayed until a certain year is reached; but the pupil should take up whatever facts his interests suggest. The fraction $\frac{1}{2}$ is just as naturally used by a six-year-old child as the combination $2 \times 2$. In teaching addition teachers are not limited to any one device. In explaining a process involving some mental retention of number, as in "carrying," it is advisable to use sticks in bundles of 10, as is often done, and to adopt, also, such devices as

$$\begin{array}{rl} 26 = 20 + 6 & \quad 26 \\ 39 = 30 + 9 & \quad 39 \\ \hline 50 + 15 = 65 & \quad 15 \\ & \quad 50 \\ & \quad \hline & \quad 65 \end{array}$$

Such devices help greatly to make the steps clear. In general, the use of splints and other objects is very helpful in approaching new facts. They can well be used in the first two years of instruction, along with diagramming and other concrete helps, and also later in the beginning study of fractions. But it should be remembered that these are only temporary helps and that the pupil should soon be able to dispense with such concrete aid. The use of the fingers in counting should be discouraged, because they cannot later be removed entirely from reach when not wanted. In subtraction the "making change" method should be used. For example, if you have 10 cents and buy a pencil for 3 cents, the child should see that you have 7 cents left, because 3 cents + 7 cents = 10 cents. This is the method used at any store, and in business in general. The Austrian method of subtraction is the one that now is most commonly favored. The example just given follows that method, one advantage being that it dispenses with the necessity of learning any subtraction table. An example like 52–27, might be worked as follows:

$$\begin{array}{lll} 52 = 50 + 2 & \text{Add 10 to each} & 50 + 12 \\ 27 = 20 + 7 & \text{which leaves the} & \underline{30 + 7} \\ & \text{difference the same} & 20 + 5 \end{array}$$

No number added to 7 will make 2. But 5 added to 7 makes 12. We have now increased 52 by 10, and we must add 10 to 27, so as not to change the difference. 3 (tens) and 2 (tens) are 5 (tens). Hence, the difference is 25.

The details of such presentations vary greatly, and a teacher should follow the plan that best satisfies her.

In short division it is often advisable to use the "long division" form, showing that the former is only an abbreviation of the latter.

A text-book in arithmetic is hardly desirable before the third year of school.

At least its earlier use tends strongly to make the work too formal.

There is little object in carrying the multiplication table beyond $10 \times 10$. In compound numbers reduction "ascending" and "descending" should be confined to numbers of not more than three denominations. The reasons for this are that in practical life we rarely use more than two denominations, as feet and inches or pounds and ounces; and that, if one has learned to perform reduction with two and three denominations, he can easily perform those with more if occasion required.

Quantitative facts are so much more often expressed decimally now than formerly, that much more attention to decimal fractions is in place.

The addition and subtraction of decimals need offer no difficulties. In multiplication the most approved forms are the following:

1. 6.25
   5.
   31.25

EXPLANATION — Since 5 times hundredths are hundredths, the right hand number of the product is placed under hundredths. The rest of the work is identical with that of integers, the decimal point going under the others.

2. 6.25
   0.5
   3.125

EXPLANATION—Since hundredths multiplied by tenths is thousandths, the right-hand figure of the product goes in the thousandths place.

3. 6.25
   0.25
   3125
   1250
   1.5625

EXPLANATION—Since hundredths multiplied by hundredths are ten-thousandths, the right-hand figure of the product goes in the ten-thousandths place.

Operations with decimals should be limited to fractions having not over three places, and answers need not be carried beyond three places.

Division of decimals should be taught as suggested in the following Austrian method:

Required to divide 6.275 by 2.5—

OLD METHOD

2.5)6.275(2.51
50
1 27
1 25
25
25

"Point off as many places in the quotient as the number of decimal places in the dividend exceeds that in the divisor."

COMMON AUSTRIAN METHOD

2.51
25)62.75
50
127
125
25
25

Dividend and divisor having been multiplied by such a power of 10 as makes the divisor a whole number, the decimal point in the quotient simply goes above that in the dividend.

The following method is recommended for the early work:

2.51
25)62.75
50
12.75
12.5
0.25
0.25

The entire remainder is brought down each time, and the decimal point is preterved throughout.

In *more advanced arithmetic*, including the last two or three years of the elementary school, the value of the work must lie largely in the character of the problems, as previously suggested. By the time a child has reached the sixth year of school, he has usually acquainted himself with the various arithmetical processes, and he is now ready for their various applications to actual conditions in life. Correlation with geography, manual training and other studies is, therefore, of much importance.

Percentage, formerly a topic by itself, is merely one phase of decimal fractions, and should be so treated. A large part of business arithmetic involves the finding of per cents, so that the method is continually applied after it is once presented. The treatment of the subject by "cases," and the learning of definitions of terms like "amount," "difference" or even "percentage" may be considered obsolete. There is need to know what "per cent" means, namely "hundredths" ("hundredth" or "of a hundredth," as in 6%, 1%, ½%), and there is occasionally some value in using the term "base." But the two leading problems of the subject are illustrated by two examples not requiring any elaborate vocabulary, namely:

1. 6% of $250 is how much?

2. If 104% of $x$ = $7.28, what does $x$ equal?

Practical problems in percentage rarely require any other forms.

The explanation of problems should consist of no carefully learned formula, but should be nothing more than an explanation of the steps involved, with the reasons. Some use of the equation, with $x$ to represent the unknown quantity, is fully in place.

In general in the study of arithmetic pupils are tempted to "figure" too much, and to allow the formal side to dominate the "thinking" side. To overcome this difficulty it is well to have much oral work in the solution of problems, without any figuring. To emphasize the *thought* side of arithmetic properly, children (1) should often read a problem a second or third time carefully, to get the exact conditions; (2) should then restate the problem in their own words, to make fully sure that they understand its condition; (3) should state

the number of steps required for the solution and show the character of each; (4) should then give the approximate answer. Figuring for the correct answer should often follow; but frequently this fifth piece of work should be omitted.

It is hardly wise to allow children to study their arithmetic and receive help upon it at home. The reason for this statement is that parents and other home friends usually have different ways of solving problems from those employed at school. Sometimes these home methods are worse, sometimes better, than those used at school. But they are almost bound to be a source of confusion. It is generally best, if home help seems necessary, for the helper to try to understand and follow the school method.

Reference books: *Mathematics in the Elementary School*; Teachers College Record, Columbia University; *Teaching of Elementary Mathematics*, D. E. Smith; *Special Method in Elementary Arithmetic*, C. A. McMurry; *The Psychology of Number*, McLellan and Dewey.

F. M. McMURRY.

**Arizo'na,** a southwestern state of the United States, is as large as Italy or New York and New England combined; area, 112,920 square miles. It is made up of great plains, mountains and cañons. The highest peak is Mt. San Francisco, 12,561 feet. The Colorado River, 1,100 miles long, runs through the mightiest series of chasms in the world, with walls of marble and granite 1,000 to 6,500 feet high. Where it is highest it is called the Grand Cañon. The Gila River is 650 miles long, and with its tributaries entirely crosses the southern portion of the territory.

*Climate.* There is a difference of both temperature and rainfall between the northern and southern sections, owing to their altitudes. Although the sandy region around Yuma is the hottest district north of the Isthmus of Panama, the dry atmosphere keeps the summer's heat from being very oppressive and makes the winter climate delightful.

*Minerals.* Arizona is rich in minerals, and mining is the chief business. Jerome is a very active mining town in the copper region; there has also been considerable development of gold mines. Coal, mica, nickel ores, wolframite, from which tungsten is made, limestone, marble, granite, sandstone, vanadium, turquoise and garnet occur.

In Navajo County is a wonderful chalcedony forest. The cracked trunks of this petrified wood are sometimes four feet thick, and show the most exquisite colors. This forest is now a part of the national park system of the United States.

*Forests.* The mountain areas of Arizona are covered with forests of pine, cedar and other timber, while the cottonwood follows every stream. In the vicinity of the San Francisco Mountains the lumber industry is quite important, but in this and other sections the government has set aside vast timber tracts.

*Agriculture.* Because of lack of water, agricultural development has been greatly retarded. The valleys are remarkably fertile, and much is expected from the arid sections with the construction of the government reservoirs and extension of irrigated areas. The products at present embrace wheat, barley, alfalfa, apricots, oranges, olives, etc. Experiments are being conducted in the cultivation of Egyptian cotton and dates, thus utilizing the arid lands of the south.

*Manufactures.* Little as yet is being done in this line, but the chief manufacturing interests are mining, smelting, lumber and the car shop works.

*Education.* The public school system is good, and education is compulsory. Illiteracy is high owing to the Mexican, Indian, Chinese and Japanese inhabitants. There are private and sectarian schools, a state university at Tucson, normal schools at Tempe and Flagstaff, high schools at Phoenix, Prescott and Mesa, and the government maintains several Indian schools. The state maintains an asylum for the insane near Phoenix, and an industrial school at Benson.

*Government and History.* The capital is Phoenix (population 11,134). Tucson, Jerome and Prescott are other large towns. An Italian friar and a freed African slave were the modern discoverers of Arizona, going there from Mexico in 1539 as missionaries. They found traces of a great and populous race, that had once lived there, either of the Pueblo or Aztec stock. The Jesuits followed these discoverers, but all their work was swept away by the Apache forays in 1828. That part of the state north of the Gila River was ceded to the United States by Mexico in 1848 and the remainder in 1853 by the Gadsden purchase. Arizona was organized as a territory in 1863, having previously been part of New Mexico. With its admission as a state, Feb. 14, 1912, the last territory passed, and continental America became wholly a union of states. Population, 259,666.

**Arkansas** (*ăr'kănsa'*), a state which takes its name from the Arkansas Indians. By act of the legislature some years ago it was declared that the correct pronunciation of the word is Ar'kansa.' It has the Mississippi River on the east, Missouri on the north, Oklahoma on the west and Louisiana on the south The state is larger than New York area 53,845 square miles.

*Surface.* The surface of Arkansas varies in elevation from the lowlands of the Mis-

sissippi Valley in the east, only a few feet above the sea level, to the Ozark Mountains in the northwest, approaching an elevation of 2,000 feet. Extending from Helena in the southeast due north to the northern limit of the state is an elevation known as Crowley's Ridge, varying in width from one to fourteen miles and having an average elevation of 400 feet. On this ridge are situated most of the important towns in eastern Arkansas. Mt. Magazine is the highest point in the state, reaching an elevation of over 3,000 feet. The central part of the state is level or rolling, much of it being extensive prairies.

*Rivers and Lakes.* The Arkansas, White, St. Francis, Ouachita and Red Rivers are the principal streams. In the higher regions they are swift and afford excellent water-power for milling interests. There are many lakes in the state, and these, together with the rivers, abound in various kinds of game fish.

*Climate.* The climate of Arkansas is equable, though in the mountainous regions the winters are somewhat rigorous. Snow rarely falls south of the Ozark Mountains. The mean annual temperature is about 63° F. The yearly rainfall is about 42 inches. In the river bottoms malarial influences render the climate somewhat unhealthful, but aside from this the climate is remarkably salubrious. Some of the finest springs in the Union may be found within its borders, notably, the famous Hot Springs where there are annually more than 50,000 visitors, Potash Sulphur Springs, White Sulphur Springs, Eureka Springs and Mammoth Spring, whose waters form a large lake and furnish water-power for several mills.

*Natural Resources.* The forests of Arkansas cover large areas, and furnish vast supplies of pine, cypress and hardwood of many varieties. In the northwest part of the state are vast beds of coal of the best quality. The zinc mines of the north are attracting the attention of capitalists, and the ore, found in large quantities, is of a very high grade. Bauxite is found in the southern part of the state and large quantities are exported. Valuable deposits of manganese are to be found in several counties. Vast beds of the finest quality of slate are located in the western part of the state. A very high grade of clay, suitable for pottery and tiling, is widely distributed in the southwest. Iron, antimony, novaculite and other minerals are to be found. The quarries furnish practically inexhaustible supplies of marble and building stones. A superior quality of onyx is found in Carroll County.

*Industries.* As an agricultural and horticultural state Arkansas takes high rank. The fertile river-bottoms yield immense crops of cotton and corn. In 1909, 718,117 bales of cotton and 50,400,000 bushels of corn were raised. Wheat, oats, barley and other cereals are grown. Alfalfa is produced in large quantities in many localities. Fruit-growing is becoming an important industry. The shipment of strawberries from Crawford County will average in value $250,000, and the apple crop of Washington County at $2,000,000. The vast acreage of peaches, some orchards containing over three hundred acres, adds much to the wealth of the state. The shipment of potatoes also reaches large proportions. A few years ago the United States government began experiments in the culture of rice on the prairies east of Little Rock. The success of the effort has been marked. The land is irrigated from pumps sunk to a depth of less than 200 feet, where abundant water-supply is found. The yield of rice averages about forty bushels to the acre, and the acreage has been very largely increased. The extensive prairies furnish excellent facilities for raising cattle, sheep and horses at moderate cost, and these are exported in large numbers.

*Manufactures.* The manufacturing interests of the state are being steadily developed. Some of the largest lumber mills in the south are located in this state, and the export of lumber is large. The largest oar factory in the world is located at Devalls Bluff, while another of much importance may be found at Clarendon. Immense stave and hub factories may be found in the northeastern part of the state, and the manufacture of sash, doors, blinds and furniture is carried on in many places. Mining forms an important industry in the western part of the state, covering an area of 2,000 square miles. The output of coal in the year 1909, was 2,122,462 tons, which was the lowest in five years, owing to failure to operate the mines for several weeks on account of local troubles. Hot Springs has the unique distinction of having an ostrich farm where over one hundred and fifty birds are kept, and the number is being steadily increased; also an alligator farm where hundreds of these saurians varying in size from a few inches in length to twelve or fourteen feet are found. The sale of ostrich plumes and of alligator hides produces considerable revenue for the promoters of these interests. The leading cities of Arkansas are Little Rock, Fort Smith, Pine Bluff, Hot Springs, Texarkana and Jonesboro. The state charitable institutions are located at the capital.

*Railroads.* The Iron Mountain, Frisco, Kansas City Southern, Cotton Belt and Rock Island have trunk lines crossing the state, while many tributary lines afford easy means of access to all parts of the state.

*Education.* Since the adoption of the constitution of 1874, education has been

steadily advancing. **The state university,** located at Fayetteville, has an enrollment of 1,000 students. The law and medical schools, under the control of this institution, are located in Little Rock, and each enrolls about three hundred students. The Branch normal school for negroes is located at Pine Bluff. The leading denominational schools are Henderson College (Methodist) and Ouachita College (Baptist), located at Arkadelphia; Searcy Female Institute and Galloway College (Methodist), located at Searcy; Hendrix College (Methodist) and Central College (Baptist), located at Conway; Arkansas College (Presbyterian), located at Batesville. The Arkansas Military Academy is located at Little Rock. Besides these there are about eighty private academies and high schools. All these institutions enjoy a liberal patronage. There are separate schools for the white and black races, but the laws contemplate that there shall be no difference in the character of the educational facilities offered. In the negro districts the colored race is represented on the school boards, and the attendance is as regular as that of the white schools. Twenty-five per cent of local school expenses are borne by the state and there is a permanent school fund derived from the land grants made to the state by the national government.

*History.* Possibly the earliest settlement in the state was made in 1686, at Arkansas Post by the French. By the purchase of the Louisiana Territory in 1803, the United States acquired its title to the territory, though it was not till 1824 that the Indian claims were finally adjusted. Arkansas became a territory in 1819 and a state in 1836. It withdrew from the Union in 1861, and was not readmitted till 1868. During the "Carpet Bag" administration the state suffered much, but since the Brooks and Baxter War, occasioned by rival claims to the office of governor, and adoption of the present constitution in 1874, the progress of the state has been marked. Population 1,753,033.

**Arkansas City,** a city in Cowley County, Southern Kansas, at the junction of the Walnut River with the Arkansas.. A canal uniting these two streams furnishes the city with water-power for manufacturing purposes. Settled in 1870, the city was incorporated in the following year. Its trade consists largely of agricultural implements, windmills, wire and mattress factories, flour, oil, lumber mills, etc. The purchasers include the Indian posts and agencies in Oklahoma. The U. S. Indian school is located near here, besides high and primary schools for whites. It is also well furnished with other public buildings, theaters and opera houses. Its trade is served by the Atchison, Topeka & Santa Fe, the Missouri Pacific, the St. Louis & & San Francisco Railways. Population 9,000.

**Arkansas** (*är'kan-saw*), a river of the United States and, next to the Missouri, the longest tributary of the Mississippi. It rises in the Rocky Mountains, and has a length of over 2,000 miles. After breaking through the Colorado cañons, it flows through Kansas, Oklahoma and Indian Territory, and cuts Arkansas into nearly equal parts. It is navigable to Fort Smith and, in high water, to Fort Gibson, 462 miles.

SIR RICHARD ARKWRIGHT

**Arkwright, Sir Richard.** On a stormy night in the year 1765, a foot-traveler knocked at the door of a thatched cottage in the village of Stanhill, Lancashire, England, and asked for shelter from the weather. The light of a candle and the whirring of a wheel guided him to that dwelling rather than to any other of the group. A cotton-spinner was there lengthening his day of toil, while his neighbors slept. At the knock the candle was blown out and the noise stopped. After a moment a voice asked:

"Who knocks?"

"Dick Arkwright."

"A spinner?"

"No, a barber and hair buyer from Bolton. I can pay for a lodging for the night."

When the stranger was admitted and the candle had been relighted, there was disclosed a strange spinning-wheel with eight spindles. The host was James Hargreaves, and this was his newly invented spinning jenny which he used secretly because his ignorant neighbors, fearing such a machine would make work scarce, had destroyed his first model. In the itinerant barber he feared no rival, and he found a sympathetic listener. From this chance encounter of two poor, unlettered laborers resulted inventions that made England the greatest cotton-manufacturing country in the world, and revolutionized the methods of the industry.

Richard Arkwright was at that time thirty-three years old. He was born in Preston, a seaport town north of Liverpool, in 1732, the youngest of thirteen children of a poor laborer. At the age of ten he was apprenticed to a barber in Bolton, and for twenty years his life was passed in a cellar shop, shaving workingmen at a penny a shave. It is doubtful if he could

read and write, "nevertheless," as Thomas Carlyle says of him, "the man had notions in his own rough head." His discovery of a method of preparing and dyeing hair for the wig-maker, lifted him out of the cellar-shop and into the highway. Hair-buying took him among the poorest workmen in the cotton spinning district. As he went from hamlet to hamlet he heard talk of the need for a better and more rapid method of spinning. The yarn was not only insufficient in quantity but was so poor in quality that flax had to be used for warp. The all-cotton fabrics had to be imported from India, and were very expensive. Arkwright saw that Hargreave's jenny could spin eight threads at once, but that the yarn was still inferior.

He had once been through a rolling mill and seen iron bars lengthened and strengthened by being forced through rolls. Why not apply the process to cotton? He had a little money laid by, but he had no knowledge of mechanics. So he employed a clock-maker to construct his machine The first part of it consisted of two sets of rolls turning on each other like those of a clothes wringer. One roll of each pair was of steel, finely ground, the other was covered with leather. The filaments of the cotton plant were drawn through the grooves, spun and compressed. Spindles then took the yarn and stretched and twisted it. Fearing the spinning frame he had invented might be destroyed, he took it to Nottingham and began to use his yarn in hosiery mills. He obtained his first patent the same year, 1769, that Watt secured his on the separate condenser stationary engine. And Arkwright was one of the first to operate a factory by steam power. He made the first all-cotton fabrics produced in England. His wonderful invention inspired the jealousy of rivals, his patents were attacked and declared void, and he was compelled to pay duty by having his goods classed as East Indian calicoes. His spinning frame was copied with impunity. However, they "couldn't copy his mind." In 1775, Arkwright took out new patents on machines for equipping an entire textile factory. It is said that no other patent ever issued was so comprehensive, and covered so many distinct mechanical inventions, all necessary to the processes of one industry. It covered every stage of manufacture from the raw fibre to the finished fabric ready for the merchants' shelves, and provided for various weaves and mixtures of cotton with wool, silk and flax.

Many biographers have scant appreciation of the man, while admitting his genius and the value of his inventions. He won a fortune and a knighthood, and he educated himself to fit his new station in life, employing private tutors and giving an hour each day to study after he was fifty years old. His force of character and executive ability are shown in his organizing the factory system. Before Arkwright's time spinning was a cottage industry, and much of the weaving was also done in private houses. The workmen labored irregularly, and the product was far from uniform in quality. Arkwright brought his workmen under a factory roof, compelled cleanliness, order and regularity of hours, and established standards in quality and quantity of fabrics produced. His cotton factory at Crawford became the model system which other plants that were to prosper had to adopt. He put into practice the principles of industrial economy that Adam Smith taught—the saving accomplished by organized, disciplined division of labor.

Aside from London, the county of Lancashire is to-day the most populous and prosperous part of England. When Arkwright patented his invention, the county had only 600,000 people. To-day Liverpool, the greatest cotton market in the world, has a greater population; and Manchester, the largest cotton manufacturing city, has nearly as many. The county has a population of nearly 7,000,000. For a century and a quarter Lancashire has grown and thriven chiefly on Arkwright's inventions, and there are few people on the globe who have not profited by them. It must be admitted, however, that the inventor was not disinterested. He never sacrificed his own interests or did anything by intention to endear himself to an admiring and grateful world. See *Heroes of Science*, by T. C. Lewis, M.A.

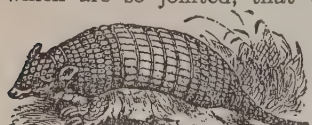
**Arlington, Mass.,** an attractive residential town in Middlesex County, situated on the Boston & Maine R. R., about seven miles northwest of Boston and connected with it by an electric railway. It has numerous fine buildings, including a well-equipped public library. Its chief industries besides market gardening, are ice-cutting and ice-tool manufacturing. Settled about the year 1650, it received its present name in 1867. See Cutter's *History of the Town of Arlington.* The population of Arlington is 12,811.

**Arma'da, Spanish,** the great expedition sent out against England in 1588 by Philip of Spain. England was at this time the bulwark of the Protestant faith, and for this reason Philip, who was the great Catholic champion, desired to crush her. For many months the Spanish nation used all its energies in gathering a mighty force, and in July, 1588, the fleet, of 150 vessels, carrying over 19,000 soldiers and 8,460 sailors, besides slaves as rowers, and armed with 2,431 cannon, set sail from Spain, under command of the Duke of Medina-Sidonia. His project was to sail through the Channel and pick up at Flanders

the Duke of Parma, who was lying there with 35,000 men. Forces were then to be landed on a different part of the English coast, while the Armada kept the Channel clear.

Meanwhile, the English had not been idle. Drake, by a bold dash at the Spanish fleet in the port of Cadiz, had delayed the attack, and when the news came that the great fleet was about to sail, forces gathered around the Earl of Leicester to oppose the landing of Parma, while the best mariners of the age, Drake, Hawkins, Frobisher and others gathered around the English Admiral Howard. They took their station at Plymouth, and, as the Spanish fleet sailed up the Channel, in the form of a crescent, seven miles long, the English took their place to windward. The next day the Spaniards attacked, but the English ships were managed with such skill that no harm could be inflicted. Dismayed at their failure, they stood off up the Channel, pursued and harassed by the English, and cast anchor at Calais. From here they were driven by means of fireships out into the open sea, a large number of ships were destroyed and almost the whole fleet was forced on the coast of Flanders. The hopes of the Spaniards were now broken, and they resolved to give up the expedition. Rather than go back through the vigilantly guarded lines of their persistent enemies, they set out on the perilous voyage by the North Sea; but the fierce northern gales scattered the fleet and drove them on the coast of Ireland and Scotland, where those escaping from the wreck were killed by the natives. Of the vast Armada only a shattered remnant of fifty-four vessels, with about ten thousand men, reached Spain.

**Armadil'lo,** a curious animal of burrowing habits, living in Mexico, Central and South America. It sometimes crosses the Mexican border into southern Texas. It is covered by an armor of bony plates, which are so jointed, that when annoyed the animal can roll itself into a ball for protection. Notwithstanding its short legs, it is said to be able to outrun a man, and can bury itself in an incredibly short time by the use of its long, powerful claws. It is about thirty inches in length; in color, brownish-black marked with yellow, and underneath a yellowish-white. It is an habitual digger, makes its burrows in the dry soil of arid regions, comes forth chiefly at night. It feeds on insects, worms, roots, fruit and sometimes carrion. In the woods and pampas large numbers are found.



YELLOW-FOOTED ARMADILLO

**Ar'mature,** pieces of soft iron or other magnetizable substance placed as the "Keepers" at the extremities of poles of magnets to preserve their magnetic power, by completing the magnetic circuit through the two poles when the electric current is sent through their coils. The armature in a dynamo is the coil of wire in which the current is generated.

**Arme'nia,** formerly a large country of western Asia, is now divided between Turkey, Russia and Persia. Its boundaries have been changed much, but in general it extends north and south from the Caucasus to the mountains of Kurdistan and east and west from the Caspian Sea to Asia Minor. From very early times a distinction was made between Greater Armenia, east of the Euphrates, and Lesser Armenia, lying to the west. Greater Armenia is usually meant when speaking of Armenia. It is mostly a high tableland, 7,000 feet above the level of the sea. Mt. Ararat is the only lofty peak. Its main rivers are the Tigris and the Euphrates. The country is naturally fertile; but now much of it is uncultivated. During its prosperity it had many flourishing towns, and its capital for centuries was Armavir. The Armenians became free from Macedonia in 317 B. C. Before that nothing really certain is known of their history, though it has recently been asserted that the Hittites were their ancestors. Since then, though at times ruled by their own kings, the greatest of whom were Valarsaces, a brother of the Parthian Mithradates the Great, and Tigranes II, their history is in the main one of conquest. Syria, Mark Antony, Persia, the Greek empire, the Mohammedans, the Mamelukes, the Kurds, the Turks, Timour the Great and the Russians have at different times conquered Armenia in whole or in part. The Armenians, once a warlike people, are now noted for their peaceful character. The area of modern Armenia and Kurdistan is 71,990 square miles, with a population estimated at nearly two and one half millions. Chief town, Erzerum, population, 80,000.

**Armin'ius,** prince of the Cherusci, a German tribe, was born about 18 B. C., and died by assassination in 21 A. D. When a boy he became a Roman citizen and served as a soldier in the Roman army. Coming home, he found the whole country stirred up by the cruelties of Varus, the Roman governor, and became the head of a conspiracy. He induced the Roman general to scatter his troops in small detachments, saying that it would keep better order among the Germans. News of the conspiracy caused Varus to march into the interior. Arminius struck the match, the scattered Roman troops were murdered and the main body was surrounded. They fought their way for three days, till

they were killed almost to a man, Varus taking his own life. Rome was filled with shame. The Emperor Augustus kept crying for days: "Varus, give me back my legions!" Germanicus marched against the Cherusci, but accomplished nothing. The next year he marched again with 80,000 men and a fleet; Arminius artfully led him into narrow passes, then, falling upon him, cut off his cavalry, almost destroyed four legions and forced him to retreat. The next year the undaunted Germanicus came with 100,000 men and 1,000 ships. On a plain called No-man's Meadow a great battle was fought. The Germans were beaten, but the next morning they fought again and compelled the Romans to retreat. No Roman army ever again marched beyond the Rhine, and Arminius is therefore justly called the *German Liberator*.

**Ar'mor,** a protection once used for the warior in battle. Armor of some sort was used by almost every nation from the earliest times until the gradual improvement in firearms made it useless. Except in very early times, when skin was used, armor has always been made of metal, usually brass or bronze. This was the sort used in the contest between Goliath and David, which is the most ancient allusion in history to armor. The armor of the Greeks consisted of a crested helmet, which could be drawn down so as fully to cover the face; a small breastplate worn so low as to leave the throat and neck exposed; a plated waistband from which hung a short kilt of cloth or leather covered with metallic plates; and greaves or a sheath of solid metal for the legs from knee to ankle. The shield was a round one, at first large enough to cover the entire body of the warrior, but later a small one was used of the same shape. The Roman soldier's armor was much the same, except that his shield was oblong, and he often fought without greaves. The earlier nations used armor made of overlapping scales of metal sewn upon leather, fitting the whole body. They also clothed their horses with this armor.

But it was in western Europe, in the middle ages, that complete defensive armor was brought to its greatest perfection. The earliest armor was made of metal rings, then sewn closely together upon leather, or simply of rings woven together like the modern curb-chain. But this mail, as it was called, could be driven by a hard blow into the flesh, and so, piece by piece, plate armor was adopted. For 200 years this change went on, until, by the time of the reign of Henry VII of England, the best and most beautiful armor ever wrought was worn. The whole suit of armor, completely covering the body, was fluted, the helmet fitted the head, and, with the plates guarding the neck, adapted itself to every movement. Every part of the body was protected, and yet motion was comparatively free. The shields were of various shapes. The heads and bodies of the horses were also protected by solid steel. So hard was it to pierce these splendid suits of armor, that at one time two armies in Italy fought from 9 o'clock in the morning until 4 o'clock in the afternoon, without a single person being killed or wounded. After firearms were invented, armor was discarded as useless, until at the beginning of the 19th century the only troops still wearing armor were the heavy cavalry of the Austrian, Russian and French armies, who were all cuirassiers. Ships-of-war are now covered with plates, called armor-plates. See NAVY.

ROMAN CUIRASS GREEK ARMOR (Art Armor)

ROMAN CUIRASS CHAIN ARMOR (Scale Armor)

**Armor-Plate,** the metallic sheathing of a ship-of-war or of a fortification, used as a protection against artillery fire. It is claimed that John Stevens of Hoboken, New Jersey, was the first to suggest the use of armor, but the first practical use was in 1855 by the French on their ships-of-war. Armor-plate manufacture has gone through several stages. The first plates were made of wrought iron, but the invention of rifled cannon made it possible to pierce any single thickness of wrought iron that could be then made. In 1873 C. Cammell & Co. invented the compound plate, which was prepared by pouring liquid steel on to hot iron plates. Then Schneider & Co., of Creusot, France, demonstrated that steel plates are preferable.

About 1890 experiments made by the United States government at Annapolis showed that a plate made of an alloy of steel and nickel is far superior to the simple steel. More recently, the resisting power of steel armor-plate has been increased 25 per cent. by the process invented by Harvey, an American. This consists in face-hardening the plates, by causing the outer layers of the metal to take up a greater percentage of carbon. The Krupp firm of Essen, Germany, discovered a new process, which is kept secret, for hardening both steel and nickel-steel plates, by which a product of unexcelled quality is turned out. Its resistance is 20 per cent. greater than that of harveyized steel. One foot of the best armor made to-day has more endurance than two feet of the best armor in 1880. It is said that the principal armor-plate makers of America, England, and France are now using this process, under agreement with Krupp. The steel is subjected, while hot, to hydraulic forging. This renders the whole mass more homogeneous than old methods, making it stronger and freer from flaws. It is next sawed or planed into plates of the required size, and then harveyized by cementation, hardening and tempering. Krupp's process carries the hardening deeper into the plate, because chrome, probably, as well as nickel is used in the steel. Hardening the steel increases the brittleness and the liability of the plate to crack, but its back remains extremely tough, and so the risk of cracking is lessened. Krupp plates resist ordinary projectiles better than Harvey armor does, but Harvey plates resist capped projectiles better and are not liable to crack. Krupp armor 12 inches thick withstands and smashes 12-inch shells, though dented four or six inches, but is cracked by 1,800-lb. torpedo shells. On May 27, 1908, the 11-inch armor plate of the Florida, a United States monitor, successfully resisted 12-inch shells containing a new high explosive. The first plates used were less than five inches thick. By 1876 solid steel plates of 22-inch thickness had been produced. Fully 4,000 tons of armor-plate are used on the exposed sides and turrets of some modern battleships.

**Ar'mour, Philip D.,** a Chicago merchant, head for many years of the great firm of Armour & Co., pork-packers and dealers in dressed meats and provisions, was born at Stockbridge, N. Y., May 16, 1832, and died at Chicago, January 6, 1901. The house with which he was long identified, and through the successful operations of which Mr. Armour amassed a large fortune, was founded in 1862 by Herman O. Armour, Philip D. Armour joining the Chicago concern in 1875. The volume of its business, which gave employment to more than 11,000 persons, exceeded a hundred millions a year. Much of his large income Mr. Armour gave away in private and public charities. The chief object of his benevolence was the Armour Institute of Technology in Chicago, which was opened in 1893, and now has 68 instructors and an enrollment of 1,800 students. Connected with this were a mission and a group of apartment buildings, rented to workingmen and their families, known as the Armour flats. Mr. Armour's enterprises included, besides the great dressed-meat factory, a grain business of large volume and ownership in a great railway system. His wealth was estimated at his death at about forty millions.

**Armour, Hon. John Douglas,** born county of Peterborough (Ontario), 1830, son of the Reverend Samuel Armour. Educated at Upper Canada College and Toronto University. Studied law with Chancellor Vankoughnet and was called to the bar in 1853. His progress at the bar was rapid. Appointed judge (Court of Queen's Bench), 1877. Made president of the court in 1887. Declined knighthood. One of the ablest of Canadian judges. Appointed one of His Majesty's Commissioners in the Alaska Boundary case. He died in 1903, in England, when on a public mission.

**Arms,** weapons of defense. Just as the invention of powder made armor useless, so it changed the kinds of weapons used, which differentiates weapons into ancient and modern arms. Of ancient arms, the most common in the earliest wars were missiles to be used at long range. Thus, in the time of the Old Testament, the bow and the javelin were the favorite weapons of oriental races, while for close fighting merely straight daggers were used. Among the Greeks the chiefs used a long and heavy spear, which they threw as a missile, often ending their combats by a duel with short swords. The masses fought with a pike, in close column or in a phalanx, which afterward became so famous in the Macedonian phalanx with which Alexander the Great conquered the world. The pike was twenty-four feet long, held in the hand, and the men were so drawn up as to present a solid front of glittering spear-points. The Romans used a short massive javelin, six feet long, which they hurled at the enemy at a distance of ten or fifteen paces, and then closed on them with their short two-edged broadswords. They depended largely on the broadsword, and the lines were so drawn up that each man had room for full play with it in single combats, in which the training of the Romans almost always secured them the victory.

In the middle ages steel-clad cavalry were the main strength of the armies. Their arms were the lance, mace, battle-

axe and the two-handed sword; but they relied mainly on the lance. This was a heavy weapon, eighteen feet in length, balanced by the weight of its butt end, which was often a foot in diameter at twenty inches from the extremity, and made to fit the arm of the champion as it was laid in rest. The infantry carried at this time the famous cloth-yard bow; the bills, like a heavy scythe blade, set erect on a four-foot shaft; the leaden mallets and long knives of the Anglo-Normans; the pikes and halberds of the Swiss; the crossbows of the Genoese; and the Scottish spear.

Modern arms begin with the battle of Pavia in 1525, when the matchlock was first used so as to be of any real service, though it was awkward and had to be used from a rest. It was gradually improved, and at the beginning of the 17th century the bayonet was added, which made it much more complete, as it gave the musketeer a means of defense at close quarters. The rifle was brought into prominence in the American Revolution and in the Revolution in France. Since that time improvement has been rapid, and the invention of the simple modern percussion lock, of the minie-rifle bullet, of revolving-chamber pistols and of breechloading of every kind has greatly increased the destructive character of warfare..

The greatest attention and most experimenting are given to field artillery. Old systems and types passed away with 1892, and in 1900 the weapon used in 1890 was not considered good enough. Machine-guns that load, fire and extract by machinery are the weapons of to-day. Some are operated by hand-power, others by the action of the powder-gases on a piston or through the recoil of the barrel. The invention of smokeless powder, the application of electricity and the use of powerful explosives in shells have in recent years doubled the efficiency of arms. The speed at which they can be discharged has also increased greatly, the U. S. warship Georgia, five years younger than the Oregon, being able to fire nearly three and a half times faster. Smoke and fouling have been done away with. The size of weapons and their recoil from firing have been lessened. Pressure in the ammunition chamber has been diminished. Soldiers as well as gunners can aim now without exposing themselves, for not only is the telescope used for sighting, by fastening it to the weapon, but there is an invention, called the hyposcope, consisting of a series of mirrors in a tube below the line of sight.

To-day, the United States regular infantry and cavalry are armed with the short U. S. rifle, Springfield model 1903, which superseded the Krag-Jorgensen. See ARTILLERY and GUNNERY.

**Armstrong, Samuel Chapman,** an educational philanthropist, was born in 1839 in the Hawaiian Islands, where his father was a missionary, and died at Hampton, Va., May 11, 1893. In 1862 he entered the Union army and rose to the rank of brigadier-general. During the war he took a hearty interest in the Freedmen's Bureau, and in 1868 he founded and became principal of the Hampton Institute of Virginia for the education of negroes and Indians.

**Ar'my,** a body of armed men, so organized and disciplined as to become a vast, movable military engine.

ANCIENT ARMIES. Sesostris of Egypt, about sixteen centuries before Christ, is the first conqueror who is said to have maintained a regular army. He divided his kingdom into thirty-six military provinces, and established a militia with which he overran Asia as far as India. Some centuries later the great Persian kings formed a vast standing army, apportioned as garrisons among the provinces, under control of military governors. In time of war this army was increased by a general levy from the barbarian peoples that had been conquered. The Greeks, who alone could resist these vast barbarian hosts, kept no standing army, but maintained militia in each small state which united in times of foreign war. They did much, however, for military science; the Spartans invented the phalanx; the Athenians added their light-armed troops and cavalry to cover the front and to harass the enemy in the rear. Miltiades is said to have first used the "double step," to increase the momentum of attack, while the Thebans first made use of the long and narrow column to pierce the lines of the enemy. The rise of the great Macedonian power marks the next standing army, which under Philip and Alexander conquered the world. Rome introduced changes in army matters that have influenced the whole civilized world. About 200 B. C. every Roman from the age of seventeen to forty-six was liable to be called upon to serve as a soldier. The levies passed through a severe course of discipline. Every year the magistrates sent up the names of the men liable to service, from which their legions were chosen, and the Roman legion in its best days excelled all other troops in discipline and valor.

ARMIES OF THE MIDDLE AGES. When the feudal system arose, national armies gave place to the small armies gathered around each chief, whose little conflicts make up the greater part of the wars of the middle ages. The crusades first united these troops into an army against a common foe, and showed the need of organization and discipline; and from this time foot-soldiers began to take the place of the

mounted chivalry which had carried on the warfare of the previous few centuries.

Modern Armies. With the use of firearms began the gradual change in army methods which has resulted in the modern military system. During the Thirty Years' war (1618–48) Gustavus Adolphus experimented with methods of dealing with infantry; the long wars of the reign of Louis XIV brought in the grouping of armies into brigades and divisions; while Frederick the Great in the next century carried tactics and drill to such a point of perfection that nearly all his victories were won by manœuvering. Horse artillery was first used during this period. The French Revolution so exhausted the resources of France that she was compelled to pass a law in 1798, making military service compulsory. Every citizen was made liable to four years' service, and all between the ages of twenty and twenty-five were enrolled. This irresistible power gave Napoleon such an advantage that the other European powers, except England, followed her example; and Prussia added the reserve system. Now, in most nations, will be found a standing army, with its several corps and body of cavalry, and an army of reserves, of two classes, those awaiting immediate call to arms and the militia or second line of reserves. Among European nations, all except Great Britain, have compulsory service. Under compulsory service the pay of the soldier is small so that at a given expense more men are kept under arms than under the volunteer system and the state has, in time of war, its entire mass of able-bodied men to draw upon. The theory that volunteers fight with more enthusiasm than conscripts is not borne out by facts, results depending rather upon the national attitude toward army service and the state. As to the enthusiastic attitude of the Germans toward army service, see Collier's *Germany and the Germans*.

United States Army. The United States has been notable for its small standing-army in time of peace as compared with European nations. Before the Civil War the army numbered but 12,000 men. During the Civil War, in various levies, a total of 2,859,132 men were mustered in for various periods of service. This immense army was quickly disbanded at the close of the war, and in 1874 a law was passed which fixed the maximum strength of the army at 25,000 enlisted men. The exigency of the Spanish-American war, however, was provided for by an increase of the regular army and the organization of a volunteer army, which reached a maximum of 58,688 regulars and 216,029 volunteers, an aggregate of 274,717. In 1901 a law was passed by Congress which increased the standing-army to provide for the needs of the government under new conditions.

On June 3, 1916, a federal law was passed providing for the gradual increase of the national guard from an immediate strength of 200 men for each senator and representative in congress to a strength of 800 for each senator and representative, making a total of 400,000. While the old law "requested" the militia of the different States to adopt the physical standards and discipline of the United States army, the new law requires it; and the progress of each organization is kept before the proper authorities by means of a system of reports and records, supplementing the annual inspection. While, previous to this enactment the president could call out the guard only to repel invasion or suppress insurrection or rebellion, this law provides that members of the guard can be drafted into the military service and that their service is not limited "to any particular class of duty or to any particular territory," thus giving the central government absolute control of the guard in time of war.

*General Staff.* By act of Congress, approved February 14, 1903, the position of commanding general of the army was abolished and a general staff corps was established, to be composed of officers detailed from the army. The general staff corps consists of one chief of staff and two general officers to be detailed by the president, four colonels, six lieutenant-colonels, twelve majors and twenty captains. The duties of the staff are to prepare plans for the national defense and for the mobilization of the military forces in time of war; to consider all questions relating to the efficiency of the army and its state of preparation for military service; to render professional aid to the secretary of war and superior commanders and to act as their agents in informing and co-ordinating the action of all the different officers to the supervision of the chief of staff; and to perform such other duties as may be prescribed by the president.

ARMY PAY.

Annual salaries of officers are as follows:

| *Grade.* | *Active.* | *Retired.* |
|---|---|---|
| Lieutenant-general | $11,000 | $8,250 |
| Major-general | 8,000 | 6,000 |
| Brigadier-general | 6,000 | 4,500 |
| Colonel | 4,000 | 3,000 |
| Lieutenant-colonel | 3,500 | 2,625 |
| Major | 3,000 | 2,250 |
| Captain, mounted | 2,400 | 1,800 |
| Captain, unmounted | 2,200 | |
| First lieutenant, mounted | 2,000 | 1,500 |
| First lieutenant, unmounted | 1,900 | |
| Second lieutenant, mounted | 1,700 | 1,275 |
| Second lieutenant, unmounted | 1,600 | |

After five years' service 10 per cent. is added to the salaries at intervals of five years until the increase amounts to 40 per cent. of the pay of the grade. Thus a colonel after twenty years' service gets $4,800 a year.

Non-commisioned officers are paid from $18 to $45 a month, and private soldiers $15. Officers and enlisted men serving

in Alaska and the island possessions are paid 10 and 20 per cent. additional, respectively.

The president (q. v.) is officially the commander-in-chief of both the army and navy and of the militia of the several states when they are called into actual service of the U. S. His position is much like that of the president of a manufacturing corporation who usually does not understand the technical processes of the business but whose services are of great value in maintaining a general supervision over policies and results. Congress may be compared to the board of directors of such a corporation for it has the power (Constitution Art. I, Sec. 8) to provide for the common defense, declare war, raise and support armies, provide for calling forth the militia, to execute the laws and for organizing, arming and disciplining the militia and governing it when employed in the services of the United States.

In monarchial countries the commander-in-chief of the army is the sovereign but, as in the United States, the control of army matters is more or less in the hands of the representatives of the people, depending upon the extent to which the monarchy approaches absolutism in those countries.

**Army-Worm,** the larva of a very common destructive moth. It appears every year in the United States east of the Rocky Mountains, but attracts attention only when it appears in great numbers. Then it marches, like an army, from one field to another, destroying the crops in its path. The worm is one and one-half inches long when full grown, and striped with black, yellow and green. Fields of grain are protected by surrounding them with ditches with vertical sides, into which the worms fall and cannot get out. Their numbers are largely kept down by fungous diseases and parasitic insects.

**Arndt** (*ärnt*), **Ernest Moritz,** a German poet and patriot, was born in 1769 on the island of Rügen. The son of a former serf, he yet received a good education with a view of entering the ministry; but after traveling over a great part of Europe he became professor of history at Greifswald. He assisted in the abolition of serfdom by his writings; and an attack on Napoleon in another work compelled Arndt to flee to Stockholm after the battle of Jena. Returning after a few years to Germany, he was active in stirring up the national feeling of his countrymen and in preparing them to throw off the foreign yoke. His songs, poems and other writings kept up the spirit of the Germans during the war of liberation. His famous song, *Was ist das Deutschen Vaterland* (What is the German Fatherland?), is sung wherever German is spoken. In January, 1818, he became professor of history in the then new University of Bonn, from which position he was suspended because of his energy in reforms, but restored in 1840. He was at one time a member of the national assembly. Vigorous in mind and body, beloved by the whole German nation as Father Arndt, he died at the age of 90 in January, 1860.

**Arnim, Bettina von,** famous for her acquaintance and correspondence with Goethe, was born at Frankfort, April 4, 1785. Her intimacy with Goethe lasted from 1807 to 1811. Shortly after his death she published a mass of correspondence said to have passed between them. There is no doubt that Bettina put a large amount of new matter into Goethe's letters, and some of them he never wrote at all. However, Bettina's freshness and power as a writer make them interesting and valuable. Her correspondence with the friend of her youth, Caroline von Günderode, and with her brother Clemens Brentano, probably equally fictitious, while not as famous as her correspondence with Goethe, is of high value. She died in 1859.

**Ar'no,** next to the Tiber the most important river of Central Italy, rises on Mount Falterona, at a height of 4,444 feet above the sea. It flows westward 140 miles and empties into the sea, eleven miles below Pisa. At Florence it is 400 feet wide, but can be forded in summer; at other times it can be navigated by barges thus far. It is noted for its rapid and destructive floods.

**Ar'nold, Benedict,** a brilliant and dashing American general, but a traitor to his country. He was born in Norwich, Conn., January 14, 1741. Reckless and fond of adventure, he ran away from home when fifteen years old, and joined the American forces in the French and Indian War but soon deserted. On the breaking out of the Revolutionary War, he helped Ethan Allen and his Green Mountain Boys to capture Fort Ticonderoga; took a gallant part in the disastrous siege of Quebec, where he was wounded, and for his bravery was made a brigadier-general; and handled with skill a flotilla in the battle of Valcour Island. Arnold had a violent temper, and when, in 1777, five of his inferiors in rank were made major-generals, he was very angry, but kept on fighting in the colonial cause showing his usual skill and bravery in the battle of Ridgefield, where his conduct gained him the rank of major-general, and in the battle of Saratoga, where his

BENEDICT ARNOLD

horse was killed under him and he himself was severely wounded. Disabled by his wound, he spent much of the winter of 1777-78 in the hospital at Albany, and the next spring was placed in command of Philadelphia. Here he met Major André, with whom he formed an acquaintance which ended disastrously for both. In 1780, Arnold, at his own request, was given command of West Point on the Hudson, one of the most important points in the colonies, which he traitorously agreed to betray into the hands of the British. After his secret interview with André, and the capture of that officer, Arnold fled to the British army, in which he was given a command. In the latter part of the war he led an attack against his native state, and when peace was declared, went to London, where he lived in obscurity until his death on June 14, 1801.

**Ar'nold, Sir Edwin,** an English poet, scholar and journalist, was born June 10, 1832, the son of a Sussex magistrate. He studied at Rochester and at King's College, London: was elected to a scholarship at University College, Oxford, where he won the Newdigate prize by a poem on Belshazzar's Feast. He taught at Birmingham, and was principal of the government Sanskrit College, at Poona, India. In 1861 he became one of the editors of the *Daily Telegraph*, London: and, in connection with it, to him was largely due the sending of Mr. George Smith to Assyria for exploratory purposes and of Stanley to Lake Victoria and down the Congo. His writings, chiefly poems, include *The Indian Song of Songs, Indian Poetry, Pearls of the Faith, The Song Celestial, The Light of Asia* and *The Light of the World.* He died March 24, 1904.

**Arnold, Matthew,** an eminent English poet, essayist and critic. He was born at Laleham, December 24, 1822, the eldest son of Dr Arnold of Rugby. He studied at Winchester, Rugby and Balliol College, Oxford, and was made a fellow of Oriel. After acting for some years as a private secretary, he was made government inspector of schools. In 1857 he was elected professor of poetry at Oxford. In 1883 he lectured in the United States. Arnold's poetical works place him in the front rank of modern poets. As a critic his literary judgments have long been received by the literary world with a higher respect than is given to the criticisms of most other writers. His prose works include *Essays in Criticism, Culture and Anarchy, Literature and Dogma, Irish Essays* and *Last Essays on Church and Religion.* He died suddenly at Liverpool on April 15, 1888. See *Letters of M. Arnold* (1848–88), collected by G. W. E. Russell and the monograph by George Saintsbury.

MATTHEW ARNOLD

**Arnold, Thomas,** headmaster of Rugby, was born June 13, 1795, on the Isle of Wight. He studied at Corpus Christi College, Oxford, and in 1815 was elected a fellow of Oriel College. As a boy he was shy and retiring, as a youth somewhat bold and unsettled in his opinions, but in his studies he took a high rank. The next few years were spent in fitting pupils for the university, in beginning his *History of Rome* and in the quiet study and thought which gave him those positive ideas of Christian belief and life which were strongly expressed in his later years. From this life he was called to be headmaster at Rugby, a position which made him famous as a teacher of boys. He had the tact to make himself both loved and feared. He made it a practice to believe his scholars. "If you say so, that is enough; of course, I believe your word." And so there grew up a feeling among the boys that it was a shame to tell him a lie. Once when he had sent away several boys, he said: "It is not necessary that this should be a school of three hundred, or one hundred or fifty boys; but it is necessary that it should be a school of Christian gentlemen." In 1841 he was made professor of modern history at Oxford, and he was just entering with enthusiasm upon his new duties, when he died suddenly, June 12, 1842. He was buried in Rugby chapel. His great work, the *History of Rome,* was broken off at the end of the second Punic War by his death. The story of his life has been told by one of his old pupils, Dean Stanley, in his *Life and Correspondence of Arnold;* but he will be best known as the schoolmaster in *Tom Brown's School-Days,* by Thomas Hughes, another of his pupils.

**A'roids,** the common name of the great plant family *Araceæ*, which contains about 1,000 species. The great display of aroids is in the tropics, where they are remarkably diversified. In our own flora, Jack-in-the-pulpit, sweet flag and skunk cabbage may be taken as representatives. One of the best known forms is the cultivated calla-lily. The feature of the group is the huge enveloping bract or spathe, which incloses the fleshy spike of inconspicuous flowers.

**Aroostook** (*a-rōōs'tŏŏk*) **War,** a somewhat jocular name given the boundary

dispute arising between the province of New Brunswick, Canada, and the state of Maine, reaching its crisis in 1839 and settled amicably in 1842. By the treaty acknowledging American independence in 1783, the boundary between the two countries was loosely defined to be the St. Croix River, eked out by a line from its source to the watershed between the streams flowing to the St. Lawrence and those to the Atlantic Ocean. The United States set up for boundary a stream far to the east of the river, only to have their contention disproved by the discovery of Champlain's little colony on the island at the true river's mouth. A branch to the east was then seized upon, but commissioners agreed upon the most westerly branch and there, in 1798, set a stone monument The watershed then fell into dispute; the United States asserted that it skirted the St. Lawrence valley, a hundred miles north. The district became known as the disputed territory. In 1829 the king of the Netherlands, to whom the dispute was referred for arbitrament, refused a decision. Ten years later, lumber-thieves began cutting timber there in defiance of all law. The Maine authorities arrested them, and were in turn arrested by New Brunswick lumbermen. Maine sent 1 800 militia to the Aroostook River, and a call was issued for 10,000 more to take possession. Sir John Harvey, governor of New Brunswick, occupied the ground with two regiments of regulars, artillery and several bands of volunteers. Nova Scotia voted all her militia and £100,000 in aid. At this crisis Gen. Winfield Scott was sent on by President Van Buren. Harvey had fought against him at Lundy's Lane and Stony Creek, and their respect was mutual. The war-fever abated, and the question was referred to a commission. In 1842 Alexander Baring, for Great Britain, and Daniel Webster, for the United States, met and framed the treaty known as the Ashburton, from the barony soon to be conferred upon Mr. Baring. Under it a line was continued due north from the monument of 1798 until it met the St. John River somewhat beyond the mouth of the Aroostook, giving New Brunswick only 5,000 and Maine 7,000 square miles of the land in dispute. When the treaty came up for confirmation in the United States senate, ratification was at first refused, the United States wanting all the territory. But when Webster produced a map which had been in his possession all the time, showing that Franklin himself in 1783 had agreed precisely upon the boundaries set up by New Brunswick, the treaty was confirmed. The survey in pursuance of the Ashburton treaty is not yet complete, but several supposedly American towns have been compelled to transfer their allegiance to New Brunswick as it has proceeded.

**Ar'pad,** the national hero of Hungary, under whom the Magyars first gained a footing in the country about the year 884. Chosen duke on his father's death, he carried on an incessant warfare with the Bulgarians, Wallachians and Moravians, and made several successful sallies into Italy. He died in 907, leaving his power to his son. The Arpad dynasty ruled Hungary as dukes until 1000, and as kings from that year until 1301. Arpad still lives in the popular songs of his country, and not a little legend has gathered around his name.

**Arrhenius** (*ăr-rē'nĭ-us*), **Svante,** a distinguished Swedish chemist, born February 19, 1859. At the age of 19 he received the degree of Doctor of Philosophy at the University of Upsala. Since 1895 he has been professor of physics in Stockholm. His most important contributions to knowledge are in the domain of physical chemistry, more particularly in the theory of solutions. The explanation which he has recently offered for the repulsion which the tails of comets experience on approaching the sun is probably the simplest and most satisfactory ever given.

**Ar'rowroot.** A well-known starch obtained from the thick underground stems of various tropical plants related to *Canna.* Arrowroot is adulterated with the starches of potatoes and corn.

**Ar'senal,** a government establishment for the manufacture, storing and issue of arms, gunpowder and other munitions of war for land and marine forces. In the United States those naval arsenals which provide for the construction and repair of war vessels, are called navy yards. In the Old World, where the term is more familiar and is equivalent to our navy yard, the most notable is the Royal English arsenal at Woolwich, a borough of the metropolis, with its great gun-factories, military carriage and transport departments, laboratories and establishments for the manufacture of ordinance and war stores, and the seat also of the Royal Military Academy for the education of cadets for the artillery and engineer service. Besides Woolwich, there are also in England notable naval dock-yards at Portsmouth, Chatham, Sheerness, Millwall and the West India docks at London, together with naval stations abroad at Gibraltar, Malta, Ascension, Bermuda, Cape of Good Hope, Sydney, Bombay and Weihaiwei. Other Old World arsenals embrace those of France at Cherbourg, Brest, Toulon, and Le Orient; those of Germany at Wilhelmshaven, Kiel and Dantzic; those of Russia at Kronstadt, Reval and Sevastopol; besides Antwerp in Belgium, Cartagena in Spain and Venice and Spezia

in Italy. In the United States the home navy yards, are at Brooklyn, N. Y., Charlestown, Mass., Kittery, N. H., Washington, D. C., League Island, Pa., Portsmouth, Va., Mare Island, Cal. and Puget Sound, Wash. Besides these, there are naval stations at Charleston and Port Royal, S. C., Key West, Fla., Algiers, La., Pensacola, Fla. and at North Chicago, Ill., for the Great Lakes service; together with torpedo and training stations at Newport, R. I., and a training station at Yerba Buena Island, Cal. In foreign parts the United States have naval stations at Tutuila, Samoa; at the Island of Guam; San Juan, Porto Rico; Culebra, W. I.; Guantanamo, Cuba; Honolulu, Hawaii; and Cavite, Philippine Islands. At home, Springfield, Mass., has from the Revolutionary era been the seat of the small-arms manufacture; Harper's Ferry at an early era also became important as an arsenal, with others, later on selected, at Watertown, Mass., Watervliet, N. Y. and Rock Island, Ill., besides a powder depot at Dover, N. J. and a proving ground at Sandy Hook, N. J. During the Civil War, there were arsenals at Springfield, Boston, Washington and elsewhere, but then, as now, for powder, small-arms and war supplies, the United States chiefly depended and depends on private factories, and on the larger manufacturing firms; also for the heavy guns used by the army and navy.

**Ar'senic.** See POISONS.

**Art.** When we think of "all creation," we think of the sky and the earth and all things in and of and around the sky and earth, including, finally, people and the things *they* have created. To this whole concept we sometimes apply the name of Nature. When we wish to distinguish from the rest of nature the things that human beings have accomplished, we sometimes use the word Art. This word is used in other senses, too, but in its largest sense it includes all those things that have been added by man to nature as he found her. In this light art might be said to begin where nature leaves off—to be, in other words, "all but nature." As a matter of fact, however, we know that nature never does and never will "leave off" so long as man "keeps on," and that art is simply our name for Nature, when she works through man's intention.

The stem A R from which the word art is descended is probably the same stem from which we get such words as *articulate*, "to fashion," "to join," and *arithmetic*, fundamentally, "a putting together," as well as *artificial* and *artisan*. The word Art signifies *a doing, a making, a fashioning* or *a putting together*, and it usually implies that the thing is accomplished by human skill.

Dr. Johnson's definition for art is "The power of doing something which is not taught by nature or by instinct;" for example we say, "the art of making violins." But the word has other applications; we have already seen that it signifies not only *the power of doing*, but also *the doing itself;* as, when we speak of "devoting one's life to art," we mean, usually, the production of works of art. Besides this the word may mean *the principles which govern the doing;* as in the phrase, "a training in art." Lastly, the word is used with reference to *the thing done*—and we speak of "French art" when we mean the productions of the artists of France.

The various arts are, in our day broadly divided into two classes, ordinarily distinguished as the useful arts and the fine arts. The meaning of the former of these terms is self-evident and it, in turn covers such subdivisions as the liberal arts, industrial arts, manual arts, household arts and others. The second term, the fine arts (see FINE ARTS), designates those activities which have their root in man's impulsive nature, with beauty in some form as their result.

The word art is nowadays often applied to fine arts alone; thus we sometimes speak of "art-lovers," meaning persons who are interested in the fine arts; and sometimes the significance of the term is narrower still so that it refers simply to sculpture and painting or even to painting only.

When any other activity than the fine arts is specifically referred to as "an art," the idea of excellence is usually implied—either in the end to be attained or in the mode of attaining the end; as, "the art of flying;" "the conjuror's art;" "the art of boiling an egg"

At all times some art or arts have been held in higher esteem than others, this often being due to the fact that some arts demand a more complex use of the faculties than others and sometimes to the circumstances under which the various arts were practiced. Under the feudal system for instance, warfare was regarded as one of the highest and most important of arts. In communities like ancient Rome, where the land was tilled by free cultivators, agriculture was considered one of the highest arts. In Pompeii, where the art of painting was practiced by the slaves exclusively, this came to be regarded as one of the meaner arts. In medieval Italy, where commerce and manufacturing became highly organized, they were ranked among the "greater arts," and the word art (*arte*) was used to designate the guilds or companies by which these activities were carried on.

There is standing in Florence to this day a beautiful building, erected by the

Arte of the Wool Merchants; connected with it is a corn-warehouse decorated with statues of the saints, contributed by the *arte* or guilds of the city, and executed by the best artists of the time.

We have spoken of the term art as covering all human activity. We have thus far avoided any special reference to that form of human activity which consists in the contemplation and analysis of nature—the subject which we call science. Nevertheless, since science strictly speaking, does not aim to produce things, but only to ascertain truths, it is clearly to be seen that it can be included only in the broadest interpretation of the term we are defining. If we can show what part of the field of human activity belongs to science, we may, by establishing its boundaries, find out just what is the field of art.

With what material does science deal? Our premise was that science deals with existing fact; all facts in nature fall within the scope of science. What is it that science does with these facts? Science observes, records, and in so far as possible explains these facts, shows their relations, one to another, and makes deductions from them. Now, with what does art deal? Art, since it adds to those things which nature has provided, deals with the production or attainment of ends, first assuming the desirability of such ends. Architecture, the art of building, for instance, assumes the need of houses and sets about producing them. Architecture calls in science with its knowledge of the stone, wood and clay which nature has provided and its knowledge of the effects of the elements upon such stone, wood and clay. Having obtained this knowledge from science, architecture acts upon it. To sum up the functions of art and science: "Science is the knowing, art is the doing. Art evolves, science involves."

It is thus seen that art cannot go on without science. Neither can science advance its investigations without the aid of art—that is to say, human activity—in carrying on its experiments and building its hypotheses. Science has been described as in the indicative mood, expressing itself by means of the declarative sentence: "Two and two are four." Art, then, is in the imperative: "Produce four." While science deals with the fundamentals by which ends are to be attained, art deals with the ends themselves, and with the attaining of them.

GEORGE WILLIAM EGGERS.

**Artemis.** See DIANA.

**Ar'tery,** the name of the tubular vessels that convey blood from the heart. There are two sets of arteries: (1) The great aorta, springing from the left ventricle of the heart and reaching by numerous subdivisions and branches all the tissues of the body. (2) The pulmonary artery, springing from the right ventricle of the heart and branching through the lungs. The former is the systemic, the latter the pulmonary system. The pulmonary artery, of course, carries venous blood. The arteries are elastic, and, when filled with blood, are stretched and exert a steady pressure on that fluid. This causes them to force most of the blood on into the veins after death, and led the ancient anatomists to believe that the arteries were air tubes and the veins only blood vessels. The arteries and veins are connected by capillaries. The aorta was named by Aristotle.

**Artesian** (*är-tē'zhan*) **Wells** are borings straight down into the ground through which water rises above the surface of the ground. The possibility of getting water in this way depends upon the rock formation at a place. There is more or less water in all rocks. Rocks which are sandy and easily broken up part with a greater or less portion of the water they receive. For example, a cubic yard of pure sea-sand can hold about one third its bulk of water. It would part with nearly the whole of this into a well sunk in it and regularly pumped from. Chalk, which is composed of fine particles closely pressed together, holds as large a proportion of water; but from the power of what is called capillary attraction—the same power that lifts the sap in trees—little water would drain into a well sunk in such a rock. Where porous layers of rock are found resting on a layer which is impervious to water and covered by another layer also impervious, the water in the middle layer is held imprisoned. Where these three layers run across a valley and up a hill on each side, they will be exposed to the air at the top. The falling rain is carried down the middle layer, and gathers at the bottom of the valley, and in time the whole porous layer becomes water logged, and the water at the center is under strong pressure. Now, if a bore is made at the bottom of the valley into the water logged layer, the pressure will force the water above the surface. The most famous artesian well is that at Grenelle near Paris, which was bored in 1833–1841. and whose water is brought from a depth of 1,798 feet. It yields 516½ gallons of water a minute, which is forced thirty-two feet above the surface. The Chinese and Egyptians knew about artesian wells, and they have been bored in the Sahara desert. There are many artesian wells in the United States, where they are utilized for supplying cities, towns, villages and farms with water.

**Artevelde** (*ar'ta-velt*), **Jacob Van,** a Flemish leader of the people in the 14th century, was a brewer in Ghent. His wealth, eloquence and talents made him

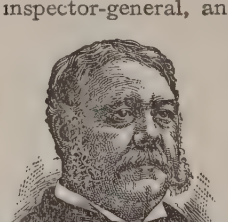
the most prominent man on the side of the citizens in their struggles against Count Louis of Flanders. The people of Ghent made him commander of their forces, and he banished from the town all the nobles and friends of the count. His power was secure for ten years, but in 1335 he made a treaty with Edward III of England, persuading him to assume the title of king of France. To strengthen this alliance, he tried to make Edward the Black Prince count of Flanders, when the people rose in rebellion and Artevelde was slain July, 24, 1345.

**Artevelde, Philip Van,** son of the above; born in 1340. In 1381 the people of Ghent, who had driven away the Count of Flanders and plundered his house, were closely blockaded by the count. At this juncture, Philip, as the son of the great Artevelde, was asked to become their leader. The count's army was badly defeated and Bruges, which had sided with the count, was plundered and submitted to Artevelde. His power only lasted a year; a French army invading Flanders routed the forces of Ghent, and many thousands were killed, including Artevelde. His death occurred in Belgium, November 27, 1382.

**Arthrop'oda.** The largest sub-kingdom of animals, containing an immense number of species. They are known by having an articulated body and jointed legs. The group embraces four great divisions or classes: 1. *Crustacea*, including the lobsters, crabs, crayfish, shrimps and others. They usually live in the water and breathe by gills. The common pill-bug is an exception. 2. *Arachnida*, the spiders, daddy-long-legs, scorpions, mites and others. In this class the head and thorax are united. They have four walking legs and no antennæ. The representatives are air-breathers. 3. *Myriapoda*, the centipedes and thousand-legged worms. They are air-breathers, with the head bearing antennæ and distinct from the thorax. The latter forms with the other joint of the body a continuous line of segments from six to two hundred in number. Each of these segments bears a pair of legs. 4. *Insecta*, the largest class, including all insects. These breathe by air tubes distributed through the body. They show great variety of form and structure. The king crabs, the fossil trilobites and the interesting peripatus (see INSECTA) are sometimes separated from the other *Arthropoda* into distinct classes.

**Ar'thur,** a prince of the Britons, who is supposed to have lived about the 6th century. He is pictured in legend as the champion of the British tribes against the Saxon invaders and as the ideal of a knightly hero. The son of King Uther, he became leader of the Britons after his father's death. He married Guenevere, the fairest princess in the land, and with her lived in splendid state at Caerleon in Wales, surrounded by hundreds of knights and beautiful ladies, patterns of valor, breeding and grace to all the world. Twelve knights, the bravest of the throng, formed the center of the retinue, and sat with the king at a round table, known as the famous Knights of the Round Table. From Arthur's court knights went forth to all countries in search of adventure, to protect women, chastise oppressors, liberate the enchanted and to enchain giants and malevolent dwarfs. Among the most renowned of these heroes of legend were Percival, Tristram, Gallahad, Lancelot and the enchanter, Merlin. Arthur was killed in battle by his nephew, Modred, who had revolted against him. His body was carried by fairies to the Isle of Avalon to be cured, whence he was expected to return some day again to lead the Britons against the Saxons. Many critics doubt the existence of Arthur, and, of course, the stories that have gathered about his name are, many of them, only beautiful legends. His fancied adventures have been sung in many languages, but for English readers they are told most beautifully in Tennyson's *Idylls of the King*. At Innsbruck, in the Franciscan church, is a magnificent ideal, life-sized, bronze figure of Arthur.

**Arthur, Chester Alan,** the twenty-first president of the United States, was born at Fairfield, Vermont, October 5, 1830. His father was the Rev. W. Arthur, D. D., a Baptist minister and a native of the north of Ireland. He was graduated at Union College, New York, and was admitted to the bar in 1853. At the outbreak of the Civil War he held the post of inspector-general, and during the war was quartermaster-general for the New York forces. When he returned to the law, he was head of an eminent law firm. He took a prominent share in politics on the Republican side. In 1871 President Grant appointed him collector of customs at the port of New York. He was elected vice-president of the United States when Garfield was made president. The death of Garfield called Arthur to the chief magistracy, and he was installed as president on September 22, 1881, and held the office till March, 1885, when he was succeeded by Grover Cleveland. During Arthur's term of office two important measures were passed by congress: a bill dealing with the Mormon question and one for the exclusion of the Chinese. His administration was



CHESTER A. ARTHUR

recognized as clean and conservative, and he retired from office with the approbation of his party and the respect of the nation at large. He died November 18, 1886.

**Arthur's Seat.** See EDINBURGH.

**Ar'ticles of Confed'era'tion.** In 1776 the Continental Congress appointed a committee to draw up "Articles of Confederation and Perpetual Union." This committee prepared the articles of confederation and submitted them to Congress in 1776. It is not definitely known who wrote them. In the fall of 1777 the articles were sent to the legislatures of all the states for consideration. Within a year and a half all the states, excepting Maryland, had ratified them. Maryland refused to do so until all the states claiming any of the northwestern lands should give up their claims to the Confederation. These claims were finally granted, and Maryland ratified the articles in 1781.

As the provisions of the articles went into effect, their weakness became very apparent. Congress was the governing body, and in it each state had one vote. On all important questions the approval of nine states was necessary to pass an act; thus a few states could easily defeat any measure. The main difficulty with this whole plan of government was that Congress could only recommend to the various states that they collect certain sums of money or raise an army of a certain size, or perform other acts for the good of the country; but had no means of enforcing its recommendations. There was no well-defined executive department, and no courts were provided. A committee which was appointed by Congress and which contained one member from each state acted during the recess of Congress and performed such duties as Congress directed. The difficulties which at once arose from so loose and incomplete a plan of government soon became so serious that a change was necessary, and so our present federal constitution was prepared and adopted.

**Artil'lery,** originally any projectile weapon or engine of war, even bows, arrows and slings, now it signifies either cannon, of any kind or the soldiers who manage them. When field-guns began to be used, it was necessary to have a special body of men to study and become familiar with the flight and range of balls, the weight and strength of cannon and the manœuvering of heavy masses of field artillery. This was the origin of the artillery corps. After the great wars of the nineteenth century artillery had become the third great branch of military service, ranking with the infantry and cavalry. When cannon first came into use, the gunners were looked upon as mechanics and had a guild of their own. When a war broke out, the different monarchs hired as many of them as they wanted, their pay being four times that of an ordinary soldier. In battle, artillery tactics consisted simply of putting the guns in position, generally in front of the line, but taking care to hide them as much as possible, until they were ready to open fire. In case of defeat they nearly always fell into the hands of the enemy, because of the difficulty of moving them. Louis XIV in 1671 was the first sovereign to create a special artillery force, and he also founded the first artillery school (1690). Among those nations which have done most to improve the artillery service are the Americans, French and Germans, the latter standing at present foremost in this line. English artillery was mainly developed within the 19th century. Field ordnance has become very effective of recent years, and, being lightened, its mobility has been greatly increased. The rapid-fire field-gun to-day fires more aimed shots in a minute than a whole battery of the old field-guns could. The new American artillery combines the best and essential features of the Wheeler and Ehrhardt guns. One of the largest guns ever built is the 16-inch breech-loading rifle of the United States seacoast cannon. It is almost fifty feet long, weighs about 130 tons and throws a 2,400 lb. projectile nearly twenty-one miles. It can pierce 42 inches of the strongest steel. The heaviest guns ever put on ships are the great guns of the British Navy. The gatling and mitrailleuse types have become obsolete. The rapid-firing, single shot Hotchkiss cannon, the Maxim-Nordenfeldt automatic cannon and the Krupp, Canet and Vickers-Maxim are the best-known types of artillery to-day. The rapid-fire guns vary from one-pounders to 13.5 rifles and from one round every two minutes to sixty in a single minute. Their range is from 7,500 to 18,000 feet. Nowadays gunners crouching behind steel shells never see the object at which they are firing. The battery commander scientifically finds the range for them and the accuracy of firing is amazing, as illustrated in our article on AERONAUTICS in connection with air scouting. In time of peace the president is authorized to reduce the battery organization. The law requires that one battery in each regiment shall be mounted, though it gives the president power to mount as many others as shall seem best to him. When not thus mounted, the batteries serve as heavy or garrison artillery, mainly in the seacoast fortifications. Special schools for artillery instruction have been founded in different countries. The United States Artillery School is at Fortress Monroe, Virginia. It aims at a course of training which shall not merely make expert artillerymen but men fitted for any office, however high in rank or command. The course is two

years, and is properly a post-graduate course with reference to the United States Military Academy.

**Ar'undel Marbles,** part of a collection of ancient sculptures and antiquities gathered among the ruins of Greece early in the 17th century at the expense of the Earl of Arundel, and since 1667 in the possession of the University of Oxford. The most valuable of the marbles is the one bearing the Parian Chronicle, a compendium of the chief events in Grecian and Athenian history, covering a period of 1,318 years or from the reign of Cecrops (1582 B. C.) to the archonship of Diognetus (264 B. C.). The Arundel Society of London, instituted in 1848 for promoting the knowledge of art by the publication of facsimiles and photographs, was named after the Earl of Arundel.

**Aryans** (*ār'yănz*), the name given to the parent race from which most of the modern Europeans are supposed to have descended. The race, possibly, lived originally in the highlands of Central Asia and spoke a common language. Now and then small groups separated from the parent fold and traveled to the northwest. The first of these groups were the Celts, who once seem to have spread over a large part of Europe, though the Welsh and Irish and a few other peoples are all that is left of them. A good while later the ancestors of the Italians, the Greeks and the Germans started westward and settled in the regions which these nations now occupy. Other tribes that set out in the same way are the Slavs, the Persians and the upper classes of Hindus. The languages of these different peoples are now quite different; but they show that they were once all part of the same root-tongue. The parent race was a peaceful, agricultural people, having a definite form of government. They probably lived in towns and built houses. All that we know about them comes from the study of the languages of European nations and of the Old-Persian and the high-caste races of Hindustan. The English are a branch of the Aryan race through the Germans.

**Asa,** son of Abijah and great-grandson of Solomon, was the third king of Judah and reigned from about 929 to 873 B. C. He was very zealous in opposing the worship of heathen gods, and is noted for the wisdom of his rule. A great army which the king of Ethiopia sent against him he completely overthrew. During most of his reign he was at war with Baasha, king of Israel, and at one time formed an alliance against him with the king of Damascus. His son Jehoshaphat succeeded him.

**A'saph,** one of the leaders of the choir appointed by King David for the religious service. His position probably became hereditary, his descendants thus forming a kind of religious order. He is supposed to have written several psalms.

**Asbes'tos,** an incombustible mineral of a flax-like, fibrous texture, composed of silica, magnesia and lime, and usually occurring in veins in highly metamorphic rocks. The sources of supply of commercial asbestos are deposits of two distinct minerals: one a variety of serpentine known as chrysotile; the other a variety of amphibole. The Canadian product, which is much prized, is of the chrysotile variety, and is chiefly found in the Thetford district, in the province of Quebec. There the more expensive grades have a value of from $150 to $250 a ton, though the mill fibre or paper stock commands but $30 or so a ton. The yield of the Canadian product in 1910, was 75,678 tons, valued at $2,458,929, the most of which was exported, only a small part being reserved for home consumption. The sources of the supply in this country are the states of Georgia and Wyoming, Idaho and Vermont. In the United States the yield in 1910 was but 3,693 short tons, valued at $68,357. The foreign sources, besides Canada, where asbestos is found, are Australia, Russia, Corsica and the Tyrol. The uses are now many to which asbestos is put, among them the manufacture of fireproof clothing, lining felt, theater curtains, etc., where protection is sought from fire; it is also in use for incasing steam pipes, pistons, hot-air joints and furnace pipes as well as for lampwicks, gas stoves and fireproof safes. It is valuable also for its heat-retaining properties. The ancients were familiar with asbestos, making use of it to envelope corpses on the funeral pyre, so as to retain the ashes.

**As'bury, Francis,** the first bishop of the Methodist Episcopal church ordained in America. He was born in Staffordshire, England, August 20, 1745. At the age of fourteen he was apprenticed to a mechanic, but two years later was led to begin work as a local preacher. Later he joined the itinerant ministry, and after three years of service was sent as a missionary to America, being appointed in the following year general assistant by John Wesley. Here he brought new life into the work, and at the outbreak of the Revolution, when many other ministers returned to England, he kept on in his labors. At the end of the war, it was decided to found an independent M. E. church for America, and he was ordained in 1784 as bishop by his colleagues who had already been ordained by Wesley in England. For more than thirty years he worked earnestly and successfully, and the wonderful progress of Methodism in America was largely due to his efforts and ability. In many respects he was much like his teacher and chief, John Wesley. He helped to lay the foundation of the first Methodist college in America in 1785. He died in Virginia in 1816.

**As'calon** or **Ashkelon,** one of the five chief cities of the ancient Philistines, lying north of Gaza on the Mediterranean. It had a shrine of the Syrian fish-goddess Derketo, and was the birthplace of Herod the Great. In Solomon's time it was subject to the Jews, but later became independent. Under the Romans it was a kind of republic and afterward the seat of a Christian bishop. The Arabs took it in 637, and in 1099 the crusaders, under Godfrey de Bouillon, gained a great victory before its walls. Recaptured by the Moslems, it was retaken after five months' siege in 1157 by Baldwin III. It was dismantled by Saladin in 1191, and completely destroyed in 1270 by Sultan Bibars.

**Ascension** (*ăs-sĕn' shŭn*) **Island.** Originally discovered by the Portuguese in 1501 and called Concepcion Island, its rediscovery on Ascension Day, seven years later, procured for it the name it still holds. It is of volcanic origin, 7½ miles long and with an area of 35 square miles, lying in latitude 7° 55′ south, longitude 14° 25′ west, 700 miles northwest of St. Helena. It came into possession of the British in 1815 and is under the jurisdiction of the admiralty, being used as a depot for coal, stores and provisions for ships on the South Atlantic station. It has been strongly fortified recently, and the discipline of a man-of-war is maintained. The population, including about 160 Kroomen, is 450. Georgetown, on the northwest coast, is the garrison station and there is an excellent sanitarium up Green Mountain. The island is a great resort of sea turtle, as well as of rabbits, wild goats and partridge.

**Ascension, Right,** in astronomy, a term used with declination (tending down or aside), for defining the position of points of the celestial concave and indicating their positions relative to each other, right ascension being measured on the equinoctial from the first point of Aries eastward, while declination measures the secondaries of the equinoctial to the north and south poles of the heavens from 0 to 90. Right ascension, which is commonly expressed in time, one hour corresponding to 15° on the celestial sphere, is invariably measured from west to east, thus corresponding to longitude on the earth, while declination corresponds to latitude. The right ascension of a star or other heavenly body is ascertained by a transit instrument and a clock.

**Ascham** (*ăs' kam*), **Roger,** a well-known scholar and teacher, was born in a small English village about 1515, and was taken into the family of a nobleman to be educated. While there he showed so much taste for study, that in 1530 he was sent to St. John's College, Cambridge. He was specially fond of Latin and Greek, and soon became known as a scholar in those languages. Soon after his graduation he began to act as a tutor, and his success brought to him the sons of many noblemen. He was then appointed Greek lecturer at the university, and in 1544 was made university orator. He was very fond of archery, and wrote a book about the right way to use the bow. He also was quite a musician as well as an artist. In 1548 he was appointed to take charge of the education of Princess, afterward Queen, Elizabeth. After traveling on the continent for a time, he became Latin secretary to Queen Mary, and when Elizabeth became queen he spent part of each day with her, reading Latin and Greek authors, of which she was very fond. His success as a teacher led him to write his famous book called *The Schoolmaster.* He died at London in 1568.

**Ascomycetes** (*ăs-kō-mi-sē' tēz*). A very large group of low plants (*Fungi*), among which the common mildews may be taken as a type. The mildews are surface parasites and are commonly found covering the leaves of the higher plants with a whitish covering. The leaves of the lilac are very commonly infested by this parasite. To this group also belong such well-known forms as the common blue mould found on bread, fruit, etc.; the common fungus, whose subterranean body produces truffles; the fungi which cause the diseases known as black knot of plum and cherry; forms which cause the witch's broom, peach curl, etc.; while to the same group belong the common cup-fungi and the edible morels; perhaps the common yeast is an ascomycete. The name of the group is derived from the fact that the spores are developed in delicate sacs, each sac being called an ascus; while the spores within these asci are known as ascospores. See FUNGI.

**As'cospore** (in plants). An asexual spore produced by the ascomycetes.

**As'cus** (in plants). A sac producing spores, characteristic of the ascomycetes.

**Asex'ual Spore** (in plants). A spore which has not been formed by the union of two cells, that is, in a sexual way. Ordinarily, the asexual spore is formed by cell division. Its power of reproduction is the same as that of the sexually formed spore, the difference between the two being simply one of origin. Asexual spores are common among all groups of plants. They are the spores most commonly seen in connection with the flowerless plants, and among the flowering plants, the so-called pollen grains are asexual spores. See SPORE.

**Ash,** a tree common to Europe and on the North American continent, of the genus *Fracinus* and family *Oleacea.* According to its variety it is valuable economically as timber used by carpenters, coachmakers and wheelwrights, as well as picturesquely for its ornamental and shade purposes. The varieties of the ash are many, includ-

ing the common ash, native to the British Isles; the white or American ash, with a light bark and pale green leaves, abundant in Canada and in the United States west to Minnesota and Texas; the red ash, met with in swampy ground in the middle states of the union: the black ash, native to New England and west to Missouri, and with its soft though tough wood, useful for barrel hoops and staves; besides the green ash, prized for its ornamental beauty in the middle states and the west; and the mountain ash or rowan tree (a species of *Pyrus*), allied to the ash tree proper only in its leaves. The two varieties familiar in the middle and northern states are the white and the black ash, and these are the most useful for their tough, yet easily worked wood, as well as for their ornamental purposes as a shade tree.

**Ashan'ti** or **Ashantee,** lately a negro kingdom in western Africa, on the north of the Gold Coast. Formerly, it was shut off from the seaboard by the Gold Coast colony, eighty miles broad, an English protectorate. Since 1896, it has become part of the northern territories of the Gold Coast under a British protectorate, and is governed by a British resident agent. Its exports are gold, palm-oil and india-rubber. Its population is from one to one and one-half millions, one fifth of whom are warriors; area of Ashanti, the Gold Coast and protectorate, about 82,000 square miles. The land is tilled near the towns, but elsewhere is a dense forest. The natives manufacture beautiful cottons, earthenware and sword-blades. They have been wont to practice human sacrifice and are polygamists, the king being allowed 3,333 wives. The capital is Coomassie (*Kumasi*).

The people of Ashanti probably came from north of the Kong Mountains. They were first heard of in 1700, when a powerful king, Osai Tutu, conquered several neighboring states. They have fought two wars with the English and lately one with the French. In 1900, there was a serious rising at Kumasi against the English, who for a time were besieged in the city, but were relieved by a force from the coast.

Progress is going steadily on, Kumasi being linked with Obassi and the coast at Sekondi by a railway 168 miles long, built at a cost of $9,034,000. The census of 1911 estimates the population in the northern territories (those beyond the eighth parallel of north latitude) at 357,569, distributed over a territory between 38,000 and 50,000 square miles in extent. They are administered by a commissioner and commandant with headquarters at Gambaga. The revenue in 1910, derived largely from caravan taxes, was $188,105, the expenditures $586,990, and the grant in aid $68,800. Permanent roads are being made, light steamers are plying the Volta, and a silver currency has been introduced with increasing benefits. Kumasi, the chief town, had in 1905 a population of 5,940

**Ashe'ville, N. C.,** the capital of Buncombe County, North Carolina, a central railroad point in the state, 210 miles west of Raleigh. Situated in the Blue Ridge Mountains and comparatively close to the Smoky Mountains of Tennessee, it has become a noted health resort. Here is Asheville College for Women, a Methodist institution, founded in 1843. Asheville is the seat of an extensive trade in tobacco. Population, including suburbs, 34,000.

**Ash'land, Ky.,** a city in Boyd County, on the Ohio River, opposite to and a little to the southeast of Ironton, O., and about 145 miles southeast of Cincinnati. It is reached by the Chesapeake & Ohio, the Norfolk & Western and other railroads as well as by steamers on the Ohio. Settled early in the fifties, Ashland became a city in 1870 and is today governed by the revised charter of 1894. Besides Central Park, a pretty, recreative area of 50 acres in the heart of the city, it has other pleasure resorts without the city limits, especially Cliffside Park. The town is important as a manufacturing and shipping center, and has an extensive trade in coal, iron ore, sheet steel, wire rods and nails, brick, lumber, furniture, leather and other products of its industrial establishments. Population, 8,688.

**Ashland, Wis.,** capital of Ashland County, Wis., in the northern section of the state, situated on Chequamegon or Ashland Bay, Lake Superior, 60 miles east of Duluth, 180 miles from St. Paul, 250 miles from Milwaukee and 410 miles from Chicago. It is the center of a large lumber, brown stone, and iron mining trade, and its position on the lake contributes to the commerce and expansion of the city. It is, moreover, the terminus of four railroads. It has a number of churches and schools and several charcoal blast-furnaces and other industries. Population, 11,594.

**Ash tabu'la, O.,** an important railway and shipping center on Lake Erie, 55 miles east of Cleveland and about midway between the latter and Erie, Pa. It possesses a good harbor, and has a large trade in shipping coal from Ohio and Pennsylvania mines and iron ore from Northern Michigan. It is a station on the Lake Shore and Michigan Southern Railroad, and has railroad connections besides with the New York, Chicago and St. Louis and with the Pittsburg, Youngstown and Ashtabula division of the Pennsylvania Lines. It has become an important manufacturing center. The town has some fine public buildings and has electric railroads and other modern equipments. Population 21,000.

**Ash Wednesday,** the first day in Lent; so called from the old church custom of

ASIA
SCALES
Statute Miles, 660 = 1 Inch.
0 100 200 300 400 500 600 700 800
Kilometres, 1062 = 1 Inch.
0 200 400 600 800 1000 1200
Rand McNally's New 11 x 14 Map of Asia.
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ARCTIC OCEAN
BRITISH ISLES
NORTH SEA
NORWAY
SWEDEN
FINLAND
RUSSIA
EUROPEAN RUSSIA
SIBERIA
FRANCE
GERMAN EMPIRE
AUSTRIA-HUNGARY
ROUMANIA
SERVIA
BULGARIA
TURKEY
GREECE
ITALY
SPAIN
PORTUGAL
MEDITERRANEAN SEA
BLACK SEA
CASPIAN SEA
ARAL SEA
TURKESTAN
AFGHANISTAN
PERSIA
ARABIA
EGYPT
SOUDAN
ABYSSINIA
BRITISH EAST AFRICA
ITALIAN SOMALILAND
INDIA
BALUCHISTAN
RED SEA
ARABIAN SEA
INDIAN OCEAN
BAY OF BENGAL
CEYLON
EQUATOR
Longitude

120°
140°
160°
180°
Bering Strait
60°
40°
20°
0°
EQUATOR
TROPIC OF CANCER
ARCTIC OCEAN
PACIFIC OCEAN
BERING SEA
SEA OF OKHOTSK
SEA OF JAPAN
YELLOW SEA
EASTERN CHINA SEA
CHINA SEA
CELEBES SEA
BANDA SEA
EMPIRE OF JAPAN
CHOSEN (KOREA)
RUSSIAN EMPIRE
SIBERIA
KAMCHATKA
ALEUTIAN ISLANDS (To U.S.)
COMMANDER Is.
KURILE ISLANDS
SAKHALIN
YAKUTSK
VERKHOYANSK MTS.
STANOVOI MTS.
MARITIME PROV.
AMUR
MANCHURIA
TRANSBAIKALIA
IRKUTSK
YENISEI
MONGOLIA
GOBI DESERT
CHINA
REPUBLIC
PEKING
Mukden
Port Arthur
Tientsin
Nanking
Shanghai
Hankow
Chungking
Chengtu
Yunnanfu
Canton
Hong-kong (Br.)
Macao (Port.)
Tsingtao
Kiaochow (Ger.)
Weihaiwei (Br.)
Fusan
Seoul
Gensan
Vladivostok
Khabarovsk
Nikolaevsk
Petropavlovsk
Yokohama
TOKYO
Nagasaki
Kagoshima
Miyazaki
Kobe
Osaka
Nagoya
Hakodate
Aomori
Sendai
Niigata
Fukuyama
Hiroshima
Matsuyama
Kochi
Kumamoto
Yamaguchi
Fukuoka
Saga
Oita
Miyanoshita
Yokosuka
Kamakura
Hachijo-shima
Bonin Is.
Volcano Is.
Marianne Islands (Ger.)
Caroline Islands (Ger.)
Guam (To U.S.)
Pelew Is. (Ger.)
Yap
Lindsay I.
Sebastian Lobos Is.
Marcus I.
Ganges I.
St. Francisco I.
Ponafidin I.
Love Wife
Volcano Is.
Ryukyu Is.
Gr. Ricchi I.
Sorodeno Is.
Kara I.
Shuri
Okinawa
Miyako I.
Yaeyama
Formosa
Taihoku
Tainan
Takao
Pescadores
Philippine Islands
Luzon
Manila
Mindoro
Panay
Negros
Cebu
Leyte
Samar I.
Mindanao
Sulu Sea
Palawan
Balabac Strait
Zamboanga
Basilan
Jolo
Sulu Archipelago
Celebes
Menado
Halmahera
Schouten Is.
Bismarck Archipelago
Kaiser Wilhelm Land (Ger.)
Dutch New Guinea
New Guinea or Papua
Terr. of Papua (Br.)
Gulf of Papua
Aru Is.
Moluccas
Borneo
Brunei
Kuching
Sarawak (Br.)
Labuan (Br.)
Gaya I.
Sandakan
Tawao
Celebes Sea
Macassar Strait
Java Sea
Sumatra
Malacca
Singapore (Br.)
Johor
Pontianak
Samboja
Banjermassin
Anambas Is.
Natuna Is.
Gr. Natuna
Simalu I.
Nias I.
Engano
Lingayen
Manila
Siam
Bangkok
Cambodia
Saigon
Hue
Tonkin
Hanoi
French Indo-China
Burma
Mandalay
Bhamo
Myitkyina
Sadiya
Upper Burma
Tonkin
Gulf of Tonkin
Hainan
Kwangchowwan (Fr.)
Pakhoi
Lungchow
Nanning
Kweilin
Yunnanfu
Tali-fu
Momien
Tengyueh
Bhamo
Lashio
Kengtung
Chiengmai
Raheng
Korat
Chantaboun
Pnompenh
Kampot
Kampong Som
Bandon
Mergui
Tenasserim
Mergui Archipelago
Isthmus of Kra
Malay Peninsula
Patani
Singora
Junkseylon I.
Salang or Junkseylon
Penang
Province Wellesley
Pulo Condore
Cape Camau
Gulf of Siam
Gulf of Cochin China
Gulf of Tonkin
Tsingchow
Wenchow
Foochow
Amoy
Swatow
Changchow
Chinkiang
Kiukiang
Ningpo
Shaohingfu
Yangchow
Soochow
Hangchow
Kaifeng
Suchowfu
Lanchowfu
Sianfu
Hanchungfu
Ichang
Shasi
Changsha
Siangtan
Yochow
Kweiyang
Anshunfu
Chungking
Chengtu
Suifu
Kiating
Luchow
Wanhsien
Kweifu
Shanghai
Nanking
Chinkiang
Yangchow
Soochow
Hangchow
Ningpo
Shaohingfu
Wenchow
Foochow
Amoy
Swatow
Hong-kong (Br.)
Macao (Port.)
Canton
Wuchow
Nanning
Lungchow
Pakhoi
Hainan
Kwangchowwan (Fr.)
Tonkin
Gulf of Tonkin
Hanoi
Haiphong
Hue
Tourane
Kwang-ngai
Binhdinh
Kwinhon
Kanh-Hoa
Phanrang
Phanthiet
Baria
Saigon
Cambodia
Pnompenh
Kampot
Kampong Som
Bandon
Chantaboun
Korat
Khorat
Raheng
Chiengmai
Lampun
Prabang
Luang
Muang Lom
Muang Pak-Lai
Muang Nan
Muang Phrae
Muang Tak
Muang Pitsanulok
Muang Sawankalok
Muang Petchaburi
Muang Ratburi
Muang Kanburi
Muang Prachinburi
Muang Chantaboun
Muang Trat
Muang Chumphon
Muang Lakon
Muang Patani
Muang Singora
Muang Ligor
Muang Talung
Muang Puket
Muang Trang
Muang Kantang
Muang Perak
Muang Selangor
Muang Sungei Ujong
Muang Malacca
Muang Johor
Muang Pahang
Muang Kelantan
Muang Trengganu
Muang Kedah
Muang Perlis
Muang Setul
Muang Langkawi
Muang Ligor
Muang Talung
Muang Puket
Muang Trang
Muang Kantang
Muang Perak
Muang Selangor
Muang Sungei Ujong
Muang Malacca
Muang Johor
Muang Pahang
Muang Kelantan
Muang Trengganu
Muang Kedah
Muang Perlis
Muang Setul
Muang Langkawi

sprinkling ashes on the head as a sign of penitence. The ashes are those of the palms consecrated on Palm Sunday. This custom was probably established by Gregory the Great (590–604). It is observed by the Roman Catholic church. The day, but not the ceremony, is observed in the Church of England.

**Asia** (*ā'shĭ-ȧ*) is the largest continent of the globe. Its name comes probably from an Assyrian or Hebrew word meaning "the rising sun." It has the Arctic Ocean on the north, the Pacific on the east and the Indian Ocean on the south. On the west is Europe, the boundaries being the Ural Mountains, the Caspian Sea, Caucasus Mountains, the Black, Mediterranean and Red Seas. It is joined to Africa on the southwest by the Isthmus of Suez and on the northeast is separated from America by Bering Strait. The immense coast line of 35,000 miles is very irregular. The Red Sea, bordering Arabia, has become, by the building of the Suez Canal, a highway of the first importance. The Arabian Sea and Bay of Bengal are wide, open divisions of the Indian Ocean. The Persian Gulf is shut in by deserts and mountains. The archipelagoes of the Pacific form the two China Seas, which, with their three gulfs, Siam, Tonquin and the Yellow Sea, constitute the Mediterranean of Asia. It is these seas that are visited by the dreaded storms called typhoons. In the north are the seas of Japan, Okhotsk and Bering.

*Area.* The length of the continent from north to south is about 5,300 miles and from east to west over 5,500 miles. The area, including islands, is estimated at 17,256,000 square miles, one-third of the dry land of the globe. The peninsulas of Asia occupy one-fifth of its area. On the south are the three greatest peninsulas, Arabia, India and Indo China. On the west, Asia Minor projects Europe-ward, and all but closes the waters of the Black Sea from the Mediterranean. In the east, are Kamchatka, Korea and the peninsula of Tchuktchis. The islands of Asia cover one-sixth of her area. In the south and east they form a dotted line running parallel to the coast.

*Surface and Drainage.* Central Asia has been called the roof of the world. It is a region of lofty mountain ranges and wide plateaus, the highest in the world. North of this elevated region lies the great plain of Siberia, extending to the Arctic, while east and south are narrower plains extending to the Pacific and Indian Oceans. Extending northeast and southwest are mountain ranges and high plateaus. The great mountains of Asia are the Himalayas, the highest in the world. They are 2,000 miles in length, and from 100 to 500 in breadth, rising along their whole length far above the line of perpetual snow. There are several peaks 20,000 feet high or more, the loftiest that has been measured, Mount Everest, being more than 29,000 feet. The Ural and Caucasus ranges are on the border of Asia.

There are two great tablelands: that of western Asia, stretching from the Black Sea to the valley of the Indus, and the higher and larger tableland of eastern Asia, stretching from the Himalayas to the northeastern point of Asia, where it meets the great central tableland of North America. The plain culminates in Tibet, the highest tableland in the world, its lowest valleys being higher than Mont Blanc. These great plains separate the lowlands of Siberia and the Aral-Caspian region from the lowlands of India and China. Across the mountains to the north of Tibet is a swamp, Lake Lob Nor, which once was a huge sea, and whose rapid drying up was probably the cause of the westward migration of the Huns and Mongols.

Drainage systems are numerous, but only those of importance demand enumeration. They include continental and oceanic drainage. The first, 4,900,000 square miles in area includes rivers emptying, as in Gobi desert, Syro-Arabia or Tibet, into the Aral, Caspian or Dead Seas, Lakes Baikal, Kalkhash or Van, or the numberless lakes, sinks or swamps of Persia, Siberia, Turkestan. The oceanic systems drain to the Arctic, Pacific and Indian Oceans and the Mediterranean. The Arctic area covers 4,367,000 miles, the Pacific 3,641,000 and the Indian 2,873,000. The Lena, Ob and Yenisei flow into the Arctic, these rivers and their tributaries, when unfrozen, giving navigation throughout Siberia. China and Tibet contribute the Amur, Hwang-Ho, Si-Kiang and Yang-Tsi-Kiang to the Pacific Ocean. Indo-China gives the Mekong, Salwin and Irawadi to the Indian Ocean; India the Brahmaputra, Ganges and Indus; Armenia the Tigris and Euphrates

*Climate and Rainfall.* On the tablelands and north of the main mountains the climate is very dry and there are great extremes of temperature, long severe winters and hot, short summers. South of the mountains and on the Pacific the climate is tropical but modified by altitude and the *monsoons* or rain-winds from the southern seas. The mean temperature ranges from nearly zero in Arctic Siberia to nearly 90° in Arabia. The lowest temperature is 100° below zero, the highest 120° above. Rainfalls vary from five inches annually over the Aral to 550 on the Khasiya Mountains near Calcutta.

*Animal and Vegetable Life.* Animals of Asiatic origin include the ass, buffalo, camel, cobra, crocodile, dromedary, dugong dolphin, elephant, goat, horse, leopard, lion, ox, pheasant, reindeer, sheep, silkworm, sturgeon, tiger, yak, zo and others. Among indigenous plants, the flora of southeastern Asia numbering 12,000 species, are the

banyan, barley, breadfruit, cedar, cotton, coffee, fig, indigo, flax, lemon, mulberry, mango olive, orange, peach, pomegranate, poppy, rice, sago, spices, sandalwood, sugar, tea, teak, the vine, wheat and many more.

*Inhabitants.* The yellow, white and brown races people Asia, but others occur. The first is the Mongolian, the typical Asiatic and three fifths of the population. The second is the Caucasian, consisting of the Semitic and the Aryan family. The third is the Malay, whose separateness as a race is questioned. One Mongolian group embraces the tribes of Siberia and Turkestan, the other the peoples of China, Indo-China and Tibet The Turks, Koreans and Japanese belong to the first group, the Chinese, Siamese and Tibetans to the second. A Caucasian group, the family of Aryans, includes Afghans, Armenians, Baluchs. Hindus, Kurds, and Persians, but excludes Europeans and Americans; while another, the family of Semites, consists of Jews and Arabs. The Malay prevails in the East Indies, Formosa, Malacca and the Philippines. Near America live Eskimos; in tropical Asia and the Philippine Islands, Negritos; and Anatolia, Arabia and Persia have Negro slaves. Of unrelated tribes hundreds exist.

*Political Divisions.* Asia is partly independent, but two thirds of the area and nearly half the people are controlled by Europe and the United States. Independent states include Afghanistan, Arabia (partly), Baluchistan (partly), Bhutan, China, Japan (including Formosa, Korea and part of Sakhalin), Nepal, Siam, some Malay states and Turkey. The dependencies are those of America, Britain, France, Germany, Holland, Portugal and Russia. America holds the Philippines. British colonial possessions include Baluchistan, British Borneo, Burmah, Ceylon, India, Hongkong, Labuan, Sarawak, the Straits Settlements and Weihaiwei. France has Anam, Cambodia, Laos, Tong-King and places in Hindustan. Germany owns Kiaochau. Holland possesses Borneo (partly), Celebes, Java, Sumatra and other islands. Portugal remains at Goa, Kambing, Macao and Timor. Armenia (partly), Caucasia, Siberia and part of Sakhalin belong to Russia.

*History.* In Asia history began. In Asia Minor originated man's oldest monuments and records outside of Egypt. Though Babylonian civilization ceased two thousand years ago, its contemporary exists yet in China. In Asia arose every great religion—Brahmanism, Buddhism, Christianity, Islam, Judaism and Zoroastrianism. (Confucianism is not a religion but a code of conduct.) Confucius, Gautama the Buddha, Mohammed, Moses, Paul and Zoroaster were Asiatics, but each affected the world as powerfully as Alexander and Cæsar.

The Aryans, possibly from east of the Caspian and north of the Hindu Kush, invaded Persia and India. Persia became the first world-empire, extending her dominion under Cyrus to the confines of Greece. Alexander in turn invaded Asia 330 B. C., conquered Persia, extended his power into India, and carried Greek ideas and culture from the Bosporus to the Indus and Oxus. On the death of Alexander his empire fell to pieces and subsequently all western Asia came under the dominion of Rome, including Arabia in part, Asia Minor and Syria; Constantinople inheriting and holding this region for seven centuries after. The power of Islam, dating from the seventh century, became dominant, building empires between the Mediterranean, Ganges and Caspian on the wreckage of Rome and extending its sway into Egypt and India. Palestine became a stage (1100–1300) for the wars of religion called crusades. Turks and Tartars issued from central Asia (1215–1415), destroyed the Saracen, Muscovite and Byzantine empires, and overthrew China temporarily. The Ottoman empire was established, however (1300), drove back the Mongols and in 1453 captured Constantinople. Mongols founded an Indian Empire (1525–1857) whose rulers included two of the best and ablest among monarchs, Akbar and Aurangzeb.

Portugal found a searoad to Asia around Africa to India (1497), China (1517), and Japan (1542), and initiated Asia's modern era. Russia started across Siberia (1580), Holland gained footing in the East Indies (1596), England's East India Company arrived in 1600, and France entered India four years later. England's Indian empire began in 1757, and France, failing in Hindustan, built an empire in Indo-China during the 19th century. America brought Japan into modern life (1854), though the Dutch had influenced it through commerce for two centuries, and in fifty years it entered among the world-powers. A war between China and Japan (1894) resulted in the cession of Formosa to Japan. The Philippines were transferred to the United States (1898) at the close of the Spanish-American war. A war between Russia and Japan (1904–5), the most sanguinary struggle of recent times, resulted in victory for Japan, with added prestige, the cession of part of Sakhalin and the control of Korea.

**Asia Minor** is the name given to the western peninsula of Asia, forming part of Turkey in Asia. Its area is about 200,000 square miles. It is the western prolongation of the high tableland of Armenia, with bare steppes, salt plains, marshes and lakes. Along the coast are mountains, from 4,000 to 6,000 feet high on the north, and on the south the Taurus range, from 10,000 to 12,000 feet in height. In general the climate is like that of southern Europe. The in-

ASIATIC TYPES

1 Ainu of Japan 2 Chinese 3 Japanese Girl 4 Shiba Man 5 Manchu 6 Golde 7 Mangune
8 Giljak Man 9 Buriat 10 Katjinz 11 Korean 12 Giljak Woman

habitants, some 10,500,000 in number, are of various races, The ruling race is the Turks, who number about 1,200,000. Allied to them are the Turkomans and Yarruks, who are nomads. Another nomadic people are the Kurds, and in the mountains are the robber tribes of the Lazes. The Greeks and Armenians are most progressive and have most of the trade, and with the Jews own most of the land.

Here were the ancient and famous countries of Ionia, Phrygia, Lydia, Galatia, Cilicia and Cappadocia, with Troy, Ephesus, Smyrna and many other noted cities. Asia Minor was the scene of great conquests. Here took place the wars of the Medes and Persians with the Scythians, of the Greeks with the Persians, of the Romans with Mithradates and the Parthians, of the Arabs, Mongols and Turks with the Byzantine empire. Notwithstanding all these wars, the country still enjoyed some measure of prosperity, until it fell into the hands of the Turks, whose harsh military rule has almost ruined it. The chief modern vilayets (Turkish provinces) are Smyrna, Angora, Trebizond, Ismid, Konia and Brussa. A number of railways now traverse Asia Minor.

**Asp,** a name loosely applied to several kinds of venomous serpents. A kind of viper in southern Europe and a snake in India, closely allied to the cobra, have received this name. Several kinds of vipers are found in Palestine, and it is not certainly known to which one the word asp in the Bible refers. Cleopatra's famous asp, by means of which she committed suicide, is believed to have been a snake called the horned viper.

**As-par'a-gus** is a tuberous rooted, perennial herb, which in some varieties is the size of a shrub. It is widely distributed in warm countries of the temperate climes and in the tropics, but is cultivated in all civilized countries. The plant grows wild on the southern coast of England, and on the plains of Russia it so abounds that the cattle devour it like grass. Its varieties number nearly 150, the best and most widely known being the esculent asparagus. For more than 2,000 years it has been cultivated for the succulent young shoots produced from the thick root stocks in spring. It is first grown a year or, if necessary, two years in a nursery bed, then transplanted to a permanent one. Shoots should not be gathered before the second spring after planting in permanent quarters. As a rule the thicker the head the better. The plant yields annually for ten or twelve years. Its important enemies are rust and beetles.

**As'pen,** also known as quaking asp and as white poplar, is a tree of much interest and beauty. It came originally from the cooler parts of Europe and Asia, and belongs to the genus *Populus*. In this country it is distributed generally north of Pennsylvania and Kentucky, and grows on the mountains of the west, south to Mexico. It is a tall, slender tree, is said to reach in the forests to the height of 100 feet, but the usual variation is from 40 to 80 feet. The bark, save at the base, is light colored; the leaves, which are a glossy green above and yellowish green below, twinkle and tremble owing to the arrangement of the long flexible stem and the light leaf-blade. There is much delicate color in the aspen, in the bark, the catkins and the unfolding leaves. It is a prized ornamental tree, grows rapidly, but is short lived. The seeds are wafted a considerable distance by means of the long hairs with which they are surrounded. It is valuable on lands devastated by forest fires, being one of the first trees to spring up in clearings and protecting later growths. It is used in turning and in the manufacture of wood pulp, but is not valued for fuel. The large-toothed aspen is a stiffer, less attractive tree, though the weeping varieties of this are employed for ornamental purposes. Its distribution in this country is from Nova Scotia to Minnesota and south to Tennessee.

**Asphalt** (*ăs'fălt*) is bitumen of purer form, being a mineral and solid or semi-solid. Its name comes from *Lacus Asphaltites*, Latin for the Dead Sea, where asphalt once abounded. It is black or brown in color, brittle in consistency (though this varies from a bright pitchy condition to thick masses of mineral tar) and compact. It melts easily about the boiling point of water, burns without making ashes, and emits a thick smoke of pitchy odor. It is widely distributed, especially in tropical and subtropical regions, but deposits of sufficient quantity for commerce and the industries occur only in a few localities. It is a product of the decomposition of vegetable and animal substances, the three preceding products being naphtha, petroleum and mineral tar. Asphaltic stone is limestone impregnated with bituminous matter. Asphalt cement is refined cement tempered with petroleum. Mastic is asphalt cement mixed with powdered limestone and sand. Asphalt concrete is crushed stone cemented with mastic and compressed. Simple asphalt is found at Auvergne (France), Caxatambo (Peru), Cuba, southern California, Switzerland, Trinidad (an island off Orinoco River) and Venezuela. Colorado, Italy, Kentucky, Oklahoma and Utah also contribute. Asphaltic limestone occurs largely in Europe. Auvergne once supplied most asphalt, Caxatambo exports a very pure variety of high luster, Cuba yields considerable asphalt of fine quality, but the supreme sources of supply in quality as in quantity are Trinidad, Cali-

fornia and Bermudez in Venezuela. Trinidad contains a lake of asphalt about one mile in diameter, and containing perhaps 6,000,000 tons. An American company exports 100,000 tons a year from this lake to the United States, the supply partly renewing itself by a constant flow of soft pitch from subterranean sources. Bermudez, where an asphalt lake covers 1,000 acres, exports very pure and hard asphalt. In California asphalt was discovered in 1879, and about 1894 beds of very pure, high grade, liquid asphalt were found, which even in its natural state already has the proper consistency for paving. The value of our domestic product almost equals that of the imported product.

Bituminous rock, which is principally used for paving streets, is usually shipped unrefined, and mixed at the place of use with other ingredients. Raw asphalt generally is impure, and must be refined before it can be used. It is manufactured into a cement by mixing it with other forms of bitumen, this cement being used to bind particles of limestone and sand in an asphalt pavement. First the asphalt is melted, the residuum from petroleum being added and this mixture being the paving cement. Clean, sharp sand, heated to 300° is added, and carbonate of lime last. The three substances are mixed thoroughly, and the product is the mixture used in paving streets. Asphalt is most used for street paving, but it is employed also for the distillation of lubricating and illuminating oils, for cements, for making black Japan varnish, drainpipes of compressed asphalted paper and roofing felts, or paper waterproofed with asphalt, and for waterproofing foundations in bridges and buildings.

Paving streets with asphalt is a simple process. The street is graded solidly to within eight inches of the proposed surface,

**Asquith, Herbert Henry,** Premier of England. Born at Morley, Yorkshire, September 12, 1852, and educated at Oxford, he became a lawyer, was appointed Queen's Counsel in 1880 and in 1886 elected to Parliament. He was made Home Secretary in Gladstone's last Cabinet; appointed Chancellor of the Exchequer under Campbell-Bannerman (q. v.) and at his death, succeeded him as Premier. Owing to criticism of his policy in the European War he resigned the premiership in 1916 and was succeeded by Lloyd-George (*q. v.*) his minister of war.

**Aspinwall.** See COLON.

**Ass.** The ass, originally domesticated from the wild ass of Abyssinia, differs from the horse in its smaller size and its long hair tufted at the end of the tail. Its fur is usually of a gray color. The unwillingness it shows to cross the smallest stream and its fondness for rolling in the dust point to arid deserts as probably its first home. Its reputation for stupidity is very old. The Egyptians represented an ignorant person by the head and ears of an ass. In the middle ages the Germans of Westphalia made the ass represent Thomas, the unbelieving apostle, and the boy who was last to enter the school on St. Thomas' Day was called the "Ass Thomas." In southern Europe, the ass has been carefully bred and thus greatly improved. The small size of the animal in cold countries is as much due to neglect as to the climate. In Kentucky, where they are used in breeding mules, being well cared for, they are fifteen hands high on an average; while in the north of India, where they are used by the lowest castes, they are no taller than a Newfoundland dog. In Syria and Egypt the ass is seen at its best, and is highly prized as a domestic animal. Its milk is very valuable for invalids. Wild asses are hunted in Persia.

**Assam** (*ăs-săm'*), a province of British India, situated north of Burma in the valley of the Brahmaputra, acquired by the British in the Burmese War in 1824, and now under the jurisdiction of a British Chief Commissioner. Its area, still largely covered with jungle, in which roam elephants, tigers, leopards and other wild beasts, is 49,004 square miles in extent, with a population, chiefly Hindus and Mohammedans, of about five and a half million. Assam has a heavy annual rainfall, with a climate of moderate temperature; the region, however, is subject to earthquakes. Its chief exports embrace tea, rice, rubber, silk, cotton, ivory and gold; it has also much coal; while petroleum and iron, though as yet undeveloped, are known to exist. In the higher elevations there is much timber. The soil in the valleys and along its chief river, the Brahmaputra, is very fertile, though the excessive rains inundate the land and at seasons imperil the tea-plantations and the rice crop. See Cumming's *With the Jungle Folk* and Hunter's *Statistical Account of Assam*; also Bronson's *Dictionary in Assamese and English.*

**Assay'ing** is the art of finding how much of a given metal there is in a metallic ore or alloy—as, the amount of iron in a specimen of iron ore or the amount of silver in a silver dollar. The term is applied particularly to processes carried out chiefly by fusion or fire assaying; but the word is also applied as wet assaying to the commercial analysis of many things where chemical solvents and reagents are used. Assay processes vary with different metals, but the method used with silver ore will serve as an illustration. The first process is called scorification. One part by weight of ore is mixed with from ten to twenty times its weight of granulated lead and half its weight of borax. This mix-

ture is put in a fire-clay dish, called the scorifier, and heated to redness in a furnace having a compartment or muffle open to the air, called a muffle furnace, until the substances are thoroughly melted. The surface of the molten lead now shows in a circular space in the center of the scorifier, while the earthy materials form a slag which forms a ring around this circle. The heating is continued until a considerable part of the lead has been oxidized to lead oxide. This goes into the slag and increases its amount so that the slag finally covers the diminishing metallic lead. Then the melted mixture is poured into a mould, and, on cooling, a lead button is seen which can be detached from the slag. The lead has taken up the silver as well as any gold that may be present. The next process is called cupellation. The cupel is a small cup made of burnt bone and is porous. The lead button is put in this vessel, after the latter has been heated to redness in a muffle furnace. The lead and other base metals that may be present are burned or oxidized, and the oxides are absorbed by the porous mass of the cupel, or sent off in the shape of vapor. Silver and gold are not oxidized, hence they remain in the metallic state. Just before the assay is finished, rainbow colors come and go over the button, and a brilliant flashing up of color marks the end of the operation. The silver button left in the cupel is finally weighed. This is one of the simplest methods, but not the only method of assaying. A crucible is sometimes used instead of a scorifier. H. L. WELLS.

**As'simila'tion** (*in plants*). A term often applied to the manufacture by green plants of starch, sugar and similar substances (carbohydrates). This process is better called photosynthesis (which see), leaving assimilation to be applied to the transformation of foods (carbohydrates, proteids, fats, etc.) into the living substance, protoplasm. Of the details of this very little is known.

**Assiniboia** (*as'sĭn-ĭ-boi'ȧ*), one of the northwest territories of Canada until 1905, when one part of it was merged in the new province of Alberta and the remainder in the new province of Saskatchewan. The city of Regina was formerly in Assiniboia.

**Assin'iboine,** an important river in northwestern Canada. The city of Brandon (Manitoba), is on its banks. Runs easterly to the Red River. The Souris and Qu'Appelle Rivers are its tributaries. Runs through a rich agricultural country. Length 450 miles.

**Assisi** (*ä-sē'sē*), **St. Francis of,** a devout Italian monk, born at Assisi in the province of Perugia, in 1182, and the founder of the Franciscan order. To his tomb, in the Church of San Francesco, Assisi, many thousands from all parts of Europe make annual pilgrimages. The church is enriched by the possession of many remarkable frescoes and paintings by Cimabue and Giotto, which depict stories from the Old and New Testaments and incidents in the life of St. Francis of Assisi.

**Associated Press,** the largest organization of its kind, is a mutual organization of persons representing newspapers, having for its purpose the collection and distribution of the important news of the world. There are about eight hundred and sixty members. For its more important service The Associated Press has its own leased wires, which form a network across the continent from Bangor, Me., to Seattle, Wash., and San Diego, Cal., and from Duluth, Minn., to New Orleans, Galveston and Tampa, Fla. The total mileage of this leased wire system is approximately: Day wires 22,000 miles; night wires 28,000. From various points along the trunk lines the report is sent to interior cities. Each of its members engages to contribute the news of his immediate vicinage to The Associated Press. The annual revenues, which are derived from assessments levied upon its members, approximate $3,000,000 while the number of words daily received and transmitted at each of the more important offices is over 50,000, or the equivalent of thirty-five columns of the average newspaper. The headquarters are in New York with bureaus at thirty-five other cities in this country and at the important capitals of other nations. It has correspondents all over the world and coöperative relations with the largest similar organizations in foreign lands. It is governed by a Board of Directors, fifteen in number, chosen for three-year terms by the members in annual meetings. It has no stock, no dividends and no profits of any character, its revenue being derived from assessments of its members.

The present organization operates under a New York charter, secured in 1900, and is the outgrowth of several earlier and competing associations.

FREDERICK R. MARTIN,
*Assistant General Manager,*
*Associated Press.*

**Association of Ideas.** By the association of ideas is meant such relations among them as will cause one to suggest others. Through the so-called laws of association psychologists have attempted to explain why a certain perception or thought is followed by certain images, sensations or ideas. Association is supposed to explain those trains of thought in which the mind pursues its own course unguided by the senses, except in so far as the original suggestion may have been a perception.

Early psychologists have many interesting allusions to the mental phenomena that are classed under the head of association of ideas, but before the time of Locke (1632–1704), it was generally assumed

that when the mind proceeded to recount in its own way the suggestions of a perception, it followed a certain logical order with greater or less error according to the quality of mind. Locke assumed that when one idea suggests another to which it is related in a logical way, no further explanation of the association is necessary; but where such association exists between ideas having no logical connection, he falls back on the explanation that they have occurred together accidentally in the past, and because of this we have formed the habit of thinking them together, so that when one recurs we immediately call up the others. If the idea *fire* suggests that of *cooking food*, association is not needed to explain the relation; if, instead, *London* is thought of, we wonder and can account for the fact only by supposing that the experience or description of a chance fire in London has proved so influential as to cause the idea *fire* to suggest its habitual associate *London*, rather than its logical or scientific premises or consequence.

Hartley (1704–1757), an English psychologist, uses the idea of association by habit to explain not merely the curious and arbitrary associations of ideas but the logical ones as well. All mental processes are, according to him, dependent on the processes in the brain. Those brain processes that occur together become associated by habit so that the re-excitement of one will cause the re-excitement of the others, and the corresponding ideas will come successively into consciousness. The discoveries of modern experimental psychology make it possible to state still more definitely the character of the associations in the brain. It is known that visual consciousness is dependent upon the excitement of structures in the rear of the brain, and that auditory areas lie in the temporal regions. Suppose that, at the time when one sees a cat, he hears the sound of the word cat Then the auditory and the visual structures are excited together. They become so associated that when again we hear the word the nervous currents discharge from the temporal into the occipital or rear portion of the brain, and the visual image of a cat rises in the mind. Apparently the sound of the name suggests immediately the visual image of the thing. Really it is the association of the two portions of the brain corresponding to the two ideas that causes the one to follow the other.

After the time of Hartley, English psychologists attempted to explain all trains of thought on the basis of association. But the knowledge of the anatomy and physiology of the brain was too imperfect to lead thinkers to value highly the theory that all mental associations depend upon habitual associations of brain processes. Instead they interest themselves in a statement of the logical relationships existing between ideas that suggest one another. They find that when ideas are similar or contrasting or come in close succession in time, or when their objects are related as cause and effect or are situated near each other in space, they are likely to call each other into consciousness. Professor James, the American psychologist, points out the fact that such laws of association may be increased indefinitely, and that they do not help one to do anything in the way of predicting the effect of a suggestion on a given mind. In his opinion, and here modern psychology agrees substantially with him, the physiological law of habit is the only real explanatory law of association. When we think logically and when our fancy riots in nonsense, we are following the same fundamental law of connecting those experiences that have occurred together in time.

Professor James, however, finds it necessary to expand his treatment of this law. The same idea may have many habitual associates. How are we to tell which one it will suggest? Other things being equal, the most frequent associate will come up. The idea of *fire* will suggest *cooking* rather than London, because the former has been associated with it much more commonly. If, however, the experience of the London fire was very exciting, as it might well have been in case the fire occurred at a hotel where we were staying, the association of *fire* with *London* might be so intense as to overcome the effect of the frequent association with cooking. Again, if one had just been absorbed in the accounts of the San Francisco disaster the idea of fire might suggest this most recent associate rather than the most frequent or the most intense ones. To know the effect of these principles so that we can predict the result of a given suggestion on a certain mind, it is necessary to know the concrete condition of this mind. Here it is that the subject of the association of ideas connects with that of apperception (*q. v.*). The experience that any new perception or idea calls up and through which it becomes apperceived depends on the laws of association, and the teacher in counting on the force of any suggestion must know the experience of the pupil and apply these laws. No amount of acquaintance with the logical relationships in the material of instruction will help, unless the teacher knows in how far these logical associations have become habitual in the mind of the pupil.

One further condition affecting the working of the law of association needs to be mentioned. The current of one's thought

is almost never determined solely by a single isolated perception or idea. The entire contents of the mind, both that which is clearly attended to and that of which one is vaguely conscious, that which is rapidly disappearing from consciousness, and that which is just rising into the mental field, feelings, images and ideas; all are more or less influential in determining what is to come by association. If the suggested ideas are related to all or most of the contents of the mind, we have what Professor James calls total recall. If, however, owing to special interest in one phase of this content the mind attends so closely to it as to call up associates suggested by it but unconnected with the other elements in consciousness, we have partial recall. When this special interesting topic is the thought of a quality, it may suggest some new object known to possess that quality. We may be thinking of the *sequoia* or big trees of California. Our attention may concentrate on the thought of their extraordinary size, and this may lead us to think of elephants. Big trees may never have been thought of in connection with elephants before. We seem to have departed from the law of habit. However, the quality of great size is habitually connected with both objects. Thus the fundamental law of association, when supplemented by the law of the special influence of interesting items, is seen to explain association by similarity, where the mind seems to be taking an utterly original course.

Finally it should be noted that while the English associationists treated the ideas as if they were comparatively distinct and unchanging elements recurring frequently in thought, modern psychologists hold that all mental elements are what they are because of the other elements that accompany them. This view is practically involved in the notion of apperception, for apperception means that the associated ideas suggested by any thought apperceive, interpret and so modify it. After the thought of *sequoia* has suggested the thought of elephants, it can never recur as it was at first. It will henceforth always be the thought of trees that are like elephants in a certain respect,

See APPERCEPTION, MEMORIZING, PSYCHOLOGY FOR TEACHERS. Consult *Principles of Psychology* by James, pub. by Holt & Co.

E. N. HENDERSON.

**Assuan Dam** (*ăs-swän*), **The.** A part of an extensive system of irrigation undertaken by the British government in Egypt. Assuan is about six hundred miles up the Nile and is below the first cataract. By building dams across the Nile at Assuan and Assiut, it is proposed to form two great reservoirs in which to store the water during the annual overflow of the river. By this means a much greater area can be irrigated and brought under cultivation, and the productiveness of Egypt greatly increased. The dam at Assuan is a mile and a quarter long. It consists of a solid wall of granite rising ninety feet above the level of low Nile, and is about sixty feet in width at the top. The plans include a roadway across the top, so that there may be communication between the two sides of the river. There are one hundred and eighty sluices in the dam, each equipped with heavy steel doors which are readily opened and closed by means of levers. It is expected that this dam will form a lake one hundred and forty miles long. The stored up water partially submerges the island of Philæ with its interesting ruins.

**Assyr'ia** was the northernmost of the three great countries which occupied the Mesopotamian plain. The Niphates Mountains of Armenia were on the north, Susiana and Babylonia on the south, Media on the east and the watershed of the Euphrates on the west. It was about 280 miles long from north to south, and about 150 broad from east to west. There are mountain chains in the north and east, and the country is watered by the Tigris. It is a very fertile region and supported in ancient times a large population. That its people reached a high degree of wealth and civilization is shown by the ruins of mighty cities, by canals and means of irrigation, by inscriptions and carefully kept records of its history—especially the Eponym canon, as it is called, which has been found to agree closely with what is said in the Bible about the Assyrians.

The Babylonian monarchy was already growing old before the Assyrian began. The early rulers were mere governors appointed by the Babylonian kings. Little by little Assyria became independent. She began to be powerful about 1320 B. C., but Tiglath-Pileser I (about 1140 B. C.) was the real founder of the first Assyrian empire. He spread the dominion of Assyria over all western Asia, from Elam to the Mediterranean and from the Armenian Mountains to the Persian Gulf. Under his son the empire decayed as rapidly as it had grown, and for two centuries Assyria played no part in history. It was during this time of decay that the Hebrew kingdom arose and was developed under David and Solomon. In 930 B. C., Assyria began once more to become important. Shalmaneser II began to reign in 858 B. C., and for thirty years engaged in wars that established the power of Assyria over all western Asia. It was this king who in 854 B. C. fought against the king of Hamath, Benhadad of Damascus and Ahab of Israel. In 745 B. C., the throne was usurped by a powerful

monarch, Pul, a Babylonian, who took the Assyrian name, Tiglath-Pileser II. He made firm the conquests of his predecessors. In earlier times it had been conquest and spoil that formed the policy of the rulers; now the conquered districts were annexed and ruled by Assyrian governors, who saw to it that a fixed tax was sent year by year to Nineveh. Sargon, who was one of Assyria's great generals, was the leader of a successful revolt of the army against a weak prince. It was he who captured Samaria, in 722 B. C., and carried away 27,000 of its best citizens. Sargon's son, Sennacherib, ravaged Judaea, capturing forty-six cities, and besieged Jerusalem, where a pestilence, referred to in the Bible, attacked his army and saved the city. In 681 B. C. began the reign of Assyria's greatest king, Esarhaddon. He at once set on foot the war which resulted in the conquest of Egypt, and which placed the ancient world for twenty years under one rule, thus giving the world the idea of a universal empire. Under Esarhaddon and his son, Asurbanipal (called by the Greeks Sardanapalus), the kingdom in 650 B. C. reached its height. Afterward revolts took place which slowly ruined it.

The modern area of Assyria (Mesopotamia), in Turkey in Asia, comprises the vilayet of Mosul (area 35,130 square miles; population 500,000), Baghdad (area 54,540 square miles; population estimated at 900,000); and Busra (area 53,580 square miles; population 600,000). The town of Mosul on the Tigris is close to the ruins of Nineveh and 220 miles by water (R. Tigris) north of Baghdad. Busra or Basra contains the town of Korna, where the Tigris and Euphrates join their waters, at the southern end of the ancient dominions of Assyria and then find their way by the Shat-el-Arab southward into the Persian Gulf. Northwest of Korna or Kurna and south of Baghdad is the town of Hillah, on the Euphrates, near the ruins of ancient Babylon and the Arab vilayet from which many Babylonian records have in our modern day been shipped.

**Astar'te** or **Ashtoreth.** An ancient oriental deity, supposed to be the moon-goddess, as Baal was the sun-god. She is mentioned several times in the Old Testament (I Kings XI: 5-33; II Kings XIII: 13). King Solomon built an altar to her. She was sometimes represented as having four wings and bearing a dove in one hand. She was worshipped by the Phœnicians, the Carthaginians, the Sicilians and by the inhabitants of Cypus.

**As'ter,** a flowering plant of the thistle family, found largely in North America, some species to be found in most regions of the globe. The word means star. In England they are called Michaelmas and Christmas daisies, because they have heads like daisies and when the weather is mild they bloom as late as those periods of the year. One variety grows at a considerable height on the mountains of Europe. The wild asters of the United States are many and beautiful, there being over a hundred native species. Several months of the year they clothe the land in royal bloom, a large part of the glory of the American autumn. The aster has been suggested as the national flower, its range is so general and it blooms so profusely.

"And everywhere the purple asters nod
And bend and wave and flit."

The purple or blue asters are very numerous, ranging from the low-growing seaside aster to the tall New England aster, sometimes reaching eight feet in height. The golden aster seeks the dry roadside, white asters grow in open wood and field and by shady roadside, an abundance of tiny flowers crowning high, wide-spreading branches. A variety of the Chinese aster, having beautifully colored florets of rose, violet, and white, is called *Reine Marguerite.*

**As'teroids,** a series of small planets, sometimes called minor planets, which revolve about the sun in periods varying from three to eight years. More than 500 of these bodies have been discovered, all having orbits lying in the space between Mars and Jupiter. Practically all of these planets are so small they can be seen only with a telescope; though Vesta, which is the largest, can at times be seen with the naked eye. Their diameters probably range between 10 miles and 400 miles.

In recent years many asteroids have been discovered by photography. If any portion of the sky is photographed with a camera attached to a telescope, the fixed stars will appear as points; but if there be an asteroid in the field of the camera, its image will be a short straight line, for it is moving among the fixed stars.

Of all known asteroids the most interesting are probably Ceres and Eros. Ceres was the first one discovered, having been detected by Piazzi, January 1, 1801. Eros, discovered by Witt of Berlin, August 14, 1898, proves to be our nearest neighbor and promises to offer, by observations of its parallax, the very best of all methods for determining the distance from the earth to the sun. Since this distance is the standard of length for nearly all astronomical measurements, Witt's discovery of this planet must be ranked among the most important astronomical discoveries of recent years. The name asteroid is due to Sir William Herschel.

**Astor, John Jacob,** millionaire, the founder of the American Fur Company, was born in Germany, near Heidelberg, in 1763. A peasant's son, he went to London in his sixteenth year, and worked with

his brother, a maker of musical instruments. In 1783 he sailed to America, and invested his small capital in furs, and after six years, by economy and industry, he had acquired a fortune of $250,000. He now sent out two expeditions to the Oregon territory, one by land and one by sea, to open a regular trade with the natives, and in 1811 established the fur-trading station of Astoria. From this time Astor's ships were found in every sea. He died in New York in 1848, leaving property estimated at $20,000,000, and a bequest of $450,000 in all to found the Astor library in New York. His great grandson, John Jacob Astor, perished in the Titanic disaster (*q. v.*).

**Astoria** (*as-tō'ri-a*), originally a fur-trading station in Oregon, on the left bank of the Columbia River, founded by the Pacific Fur Company in 1811 and named from its chief proprietor, John Jacob Astor. It was a main issue in the American claim to Oregon. Its industries include logging, saw, lumber and planing mills, and there are many large salmon-tinning establishments in the neighborhood. It has a fine harbor, is an N. P. terminal and so has large shipping interests. Washington Irving has told the story of the beginnings of Astoria, in his book of that name. Population, 12,000.

**Astor Library, The,** New York, now embraced in the New York Public Library, was founded under the will of John Jacob Astor, who left $450,000 for a public library in the city of New York. This munificent sum was increased subsequently to a million by gifts from his son and grandsons, one of whom, Wm. Waldorf Astor in 1882–85 was United States minister to Italy. Among the first trustees appointed by Mr. Astor himself were Washington Irving and Fitz-Greene Halleck. The library was opened in 1854 with 90,000 volumes. In 1895 it had about 300,000 volumes. In some departments, as oriental languages, it is unsurpassed by any library in the country. The Astor library was in 1895 consolidated with the Lenox library, and, with the Tilden bequest, is now housed in the New York Public Library, situated in Bryant Park, 5th avenue and 42nd street. See NEW YORK PUBLIC LIBRARY.

**Astrakhan** (*ăs-trà-kăn'*), a government in the southeast of European Russia; area 91,042 square miles; population, 1,005,460. It is watered by the Volga and washed by the Caspian Sea. The climate is severe, and the population is noticeable for the number of its nationalities. For the government of Astrakhan a reformed tribunal, but without jury, was introduced in 1894, when a reformed system of justice was organized for other departmental districts of Russia.

Astrakhan, its capital and one of the chief towns of Russia, is built on a high island in the Volga, forty-one miles from its mouth. It is surrounded by fruit trees and vineyards, and consists of the fortress, the white town and sixteen suburbs. A canal runs through the city. The population, 121,580, consists of Russians, Armenians, Tartars and Persians. Astrakhan is the principal harbor on the Caspian Sea, and its great markets every year attract many thousands of merchants, while its three bazars are among the busiest marts in Europe or Asia. Its fisheries rank among the greatest in the world. Enormous numbers of sturgeon are taken. The industries are shipbuilding, dyeing, silk-making, tallow-melting, oil-refining and soap-making. Almost the entire commerce with Persia and Transcausasia passes through the city. The main imports are wheat, barley, woolen stuffs, spirits, iron, tin, drugs, raw silk and cotton fabrics.

**Astrol'ogy,** the so-called science of predicting events by means of the positions of the heavenly bodies. It is one of the oldest of the sciences, being found among the Egyptians, Chaldeans, Hindus and other eastern nations at the very beginning of history. It made its way to the western nations of Europe, and reached its height of popularity in the 14th and 15th centuries, when chairs of astrology were established in some of the European universities. Bacon, Napier, Kepler and other scientists of their period believed to some extent in astrology, and Wallenstein, the great general of the Thirty Years' War, believed in it implicitly. With the acceptance of the Copernican system and the growth of science, the belief in astrology has almost died out.

**Astron'omy.** There is a certain sense in which the history of each science extends back into the early periods of antiquity, and even into the prehistoric past. But in this respect astronomy has a history which is unparalleled, except possibly by that of mathematics and of medicine; for the earliest men were astronomical observers. The seasons could not be determined, the sea could not be navigated, and geography could not be written without considerable knowledge of the stars and their motions. The result is that astronomy was in a very advanced state as early as the time of Thales (640–546 B. C.); and more than a century before the Christian era it was an astonishingly complete and well-systematized science, a result mainly due to the observations of Hipparchus and to the systematic treatment of Claudius Ptolemy.

At this period the Greeks were familiar with the uniform motion of the fixed stars, and the variable motion of the planets; they knew how to measure latitude and longitude and how to compute eclipses; they had not only determined the fact of the precession of the equinoxes, but had

obtained its value with great precision. Meanwhile, Hipparchus had completed a catalogue giving the positions of no less than 1,088 stars.

The modern science of astronomy may rightly be said to date from Copernicus (1473–1543), who first saw that the sun is the center of what we now call the solar system; at least, he saw that this is a simpler way of looking at the matter than to consider, as the Greeks had done, that the earth was the center of this system.

A couple of centuries after the time of Copernicus, Richer found that the acceleration of gravity diminishes as one proceeds from the equator to the poles. This made it almost certain that the earth was in rotation. In 1726 Bradley discovered the aberration of light, a phenomenon which could not occur, as it does, unless the earth were revolving about the sun. These phenomena and the law of gravitation, as employed by Newton, practically complete the evidence for the Copernican view; unless we add the discovery by Bessel, in 1838, of the annual parallax of the fixed stars.

The invention of the telescope about the beginning of the 17th century gave a tremendous impulse to astromical discovery. Galileo, Huygens, Newton and many others shortly made and used their own instruments. The continuous improvement in the telescope has been accompanied by a continuous extension of the solar system from that date up to the discovery of the fifth satellite of Jupiter by Barnard in 1892. Advances in our knowledge of the stellar systems lying beyond our own have been made *pari passu* with the improvement of the telescope. Of the more than 1,300 double stars recently discovered by Burnham, pracically none could have seen as double by any telescope in existence at the beginning of the 19th century.

Modern astronomy, like most other subjects, has grown into a science of such enormous proportions that it is studied by a great variety of men under a great variety of subdivisions.

BRANCHES OF ASTRONOMY.

Among these branches of astronomy are the following:

1. *General*, sometimes alled *descriptive, astronomy*, which includes a general survey of the entire subject, including both the phenomena and the principles of the science.

2. *Mathematical*, sometimes called *theoretical, astronomy*, which assumes the law of gravitation and then proceeds to compute orbits, prepare tables and determine all the motions of the heavenly bodies.

3. *Practical astronomy*, which deals with work in the observatory proper, including a study of various methods and instruments there employed. The fundamental instruments are the clock, the telescope and the divided circle for measuring angles.

4. *Astrophysics*, a comparatively new branch of the science, made possible largely by the discovery and development of the spectroscope. Astrophysics is simply the physics of the heavenly bodies, and has to do with their composition, their temperatures, their states of aggregation, their atmospheres, their radiations and even their motions. The fundamental instrument, but by no means the only instrument employed by the astrophysicist is the spectroscope.

SUMMARY OF DISCOVERY.

Passing now to a brief survey of the astronomical discoveries, we may outline the matter as follows:

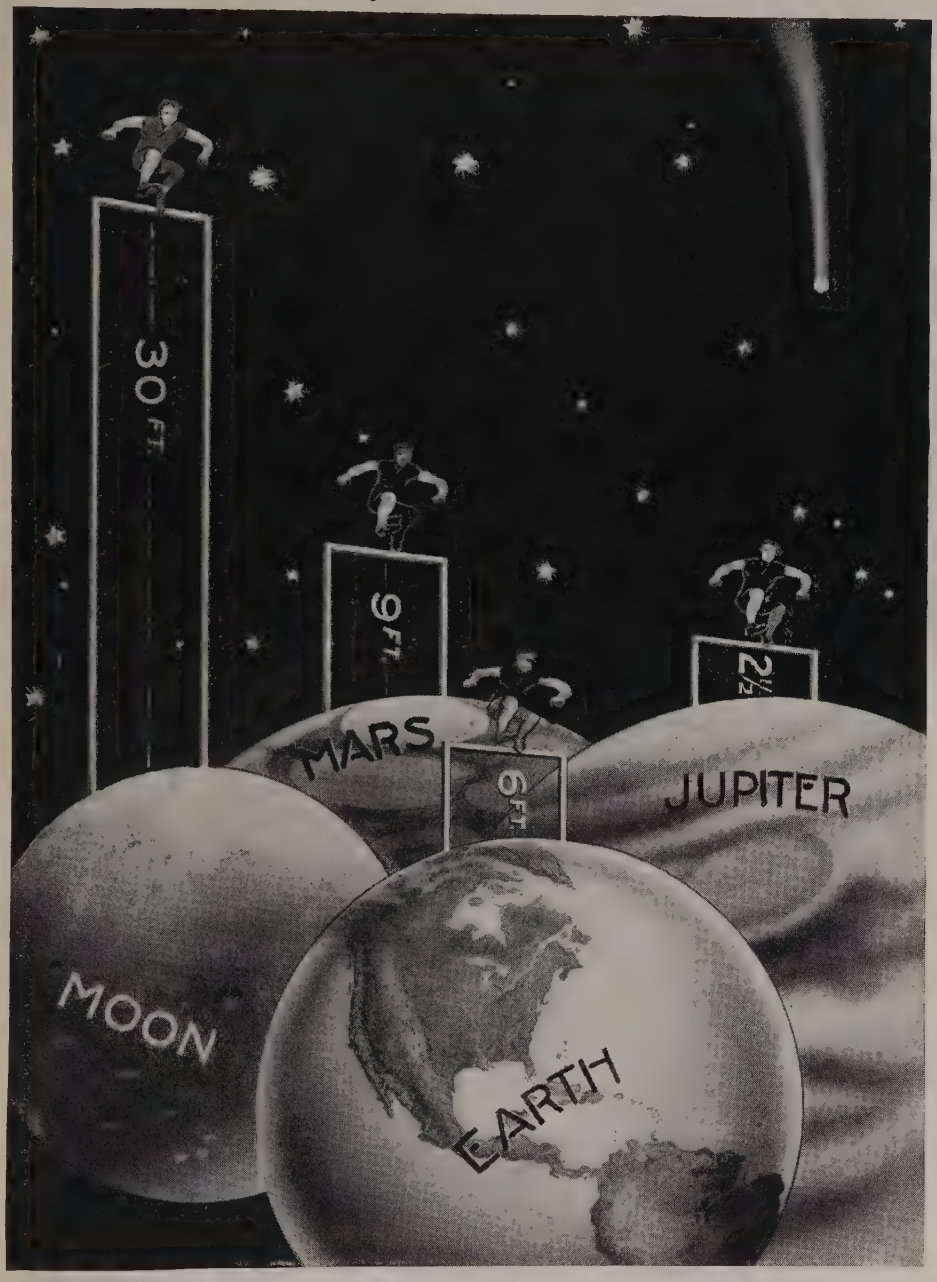
1. The Sun, which is, to us, the most important of all the heavenly bodies, being the one upon which we are dependent for our daily existence, is simply one of the fixed stars. It appears much larger than any other of these stars simply because it is many thousand times nearer us than the nearest of the stars. See SUN.

2. About the sun as a central body there have been discovered many bodies which are distributed at distances varying from one third to thirty times the distance of the earth from the sun. These bodies reflect the light of the sun and have, to the naked eye, the appearance of stars. Since, however, their apparent position in the sky changes from night to night, they are called planets, which is merely the Greek word for wanderers. Besides the earth, which is one of these planets, there are seven others of importance, and besides these eight there is a large number of similar bodies, much smaller in size, called asteroids. See PLANET and ASTEROIDS.

3. Now and then the solar system entertains visitors from other parts of the universe. These stray bodies, which come into the solar system for a few days or, at most, for a few months, and then leave it again, are called comets, for the reason that they resemble a star with flowing hair. Comets are probably composed largely of hydrocarbon gases, since the spectrum which they exhibit is always that of the Bunsen burner. But what is the source of their light, what is their origin and why their tails are repelled by the sun are still unsolved problems.

4. Leaving the solar system and passing out into space, our nearest neighbor is another great sun (as we learn by the spectroscope), whose distance from the earth is such that more than three years is required for light to travel from it to us. This star, which is called *a Centauri*, is said to be fixed, since from year to year its motion is so small that it can be detected only by very careful and delicate measurements. Most of the stars one

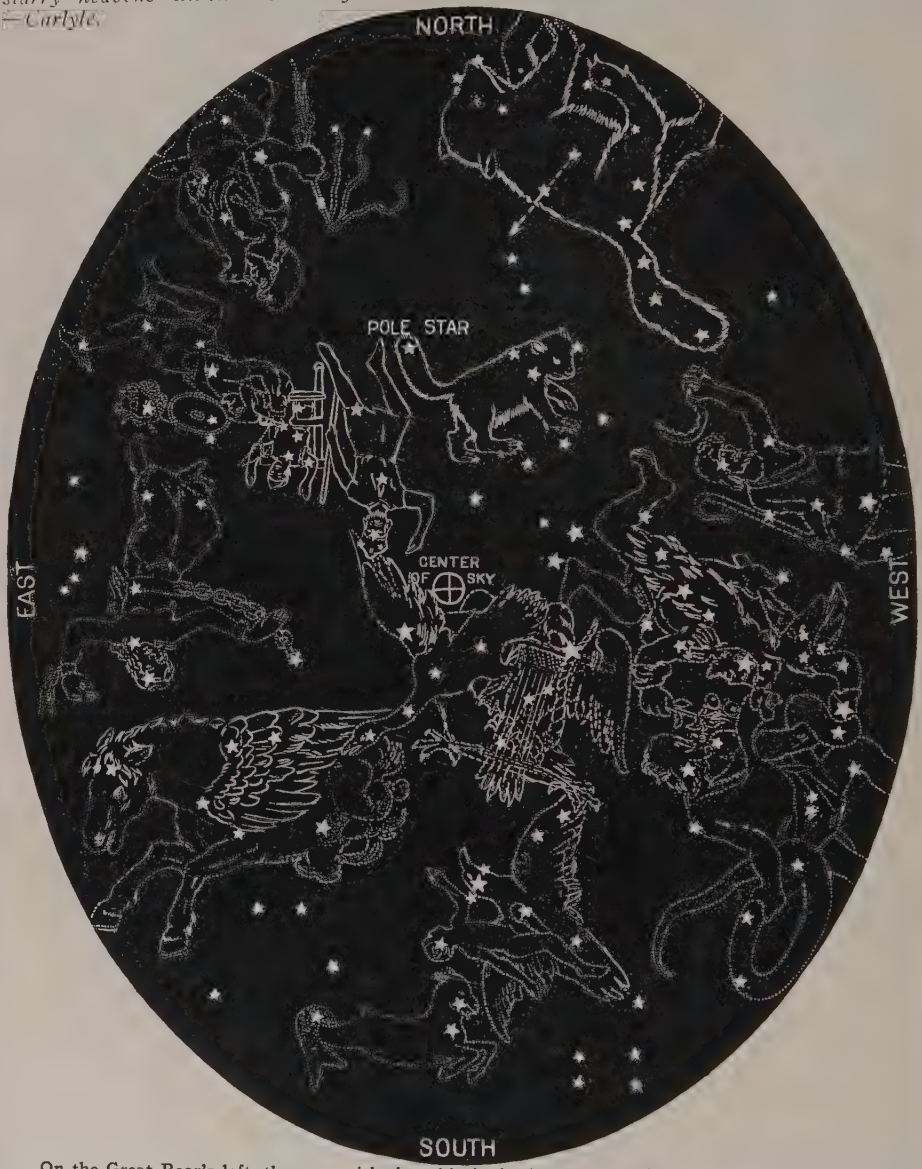
# THE HIGH JUMP ON THE MOON




This illustration shows the difference between the pull of gravity on different planets and on the Moon. On the Earth an athlete can jump six feet high, but on Jupiter he could only jump two and one-half feet high, because Jupiter is so much larger and the force of gravity is so much stronger. However, on Mars, which is smaller than the Earth, and the force of gravity considerably less, the same athlete could jump nine feet high, and the Moon is so small that he could jump thirty feet high with the same amount of effort.

## Story of the Constellations

*Why did not somebody teach me the constellations and make me at home in the starry heavens which are always overhead and which I do not know to this day?*
—*Carlyle.*




On the Great Bear's left, the man with the whip is Auriga, the Charioteer. He is carrying Capella, the Goat, who nursed Baby Jupiter. Perseus, with his shield, carries the head of Medusa of the Snaky Locks and is about to rescue the beautiful Andromeda, who is chained to a rock. In the chair is Cassiopeia, mother of Andromeda, who after Andromeda's rescue was chained to her chair and swung round and round the pole. This constellation is the well-known "W" which you can easily find. By Cassiopeia's feet is her husband, Cepheus, King of Ethiopia. Only the head and forelegs of Pegasus, the Winged Horse, are represented in the sky. The Sea Goat with the fish's tail, is Capricornus. On the right of the picture, Bootes carries his sickle, herdsman's crook. Next is Hercules with his club. Below Hercules is Ophiuchus, the Serpent Bearer. Near the center of the sky is the Swan. Next is the Winged Lyre and below Aquilla, the Eagle, carries Ganymede to Jupiter to be his cup-bearer. It takes nearly ten years for light to travel from Albireo, the star in the swan's head, to the earth, so you will not see this star as it is when you look at it, but as it was ten years previous.

sees on any clear night belong to this class. They are all so far away that, however much they may be magnified, they still appear as bright points.

In addition to these, a telescope will reveal a number of double suns, or double stars as they are called, each revolving about the other. Even a small telescope will also reveal many bright objects having the appearance of a small bright cloud or patch of light. Such a body is called a *nebula*, which is merely the Latin word for small cloud. These nebulæ possess the utmost variety of form; have fixed position as fixed stars do; are composed of gases, including hydrogen and probably helium; and, in fact, exhibit nearly every gradation in appearance from a bright cloud to a bright star. Nebulæ probably represent the fixed stars in the earlier stages of their development. See LAPLACE.

The four groups of bodies just mentioned include practically all that we meet in the universe about us, if we except those small particles which the earth encounters now and then, some of which burn in the earth's atmosphere and are called shooting stars or meteors. Some of these are large enough to penetrate the entire atmosphere and reach the earth's surface, in which case we call them meteoric stones. Certainly some, and possibly many, of the bodies mentioned above are accompanied by other small bodies revolving about them. These bodies are called moons or satellites, and are included as a part of the body about which they revolve. See MOON.

For an excellent and elementary treatment of this science see Young's *General Astronomy;* also, Chambers' *The Story of the Stars* (N. Y., 1895). HENRY CREW.

**As You Like It** is a comedy of Shakespeare, written probably in 1599 and founded as to its plot upon *Rosalind*, a novel by Thomas Lodge. In *As You Like It* Shakespeare imagines a sort of golden age, in which an ideal life according to nature is led by the outlawed Duke and his court "under the shade of melancholy boughs" in the forest of Ardennes. The bright wit and beauty of the dialogue and the combination of romance, philosophy and art in this play, make it one of the most readable of the works of Shakespeare, and still a favorite drama upon the stage. In no other play are grace and thought so exquisitely mingled and touched with humor.

**Atacama** (*ä'tä-kä'mä*) **Desert,** a region in the northern part of Chile which, on account of its location, is not reached by the rain-bearing winds and consequently receives almost no rainfall. The surface is mountainous and sterile, but is rich in minerals, especially copper. In the more elevated parts are found rich deposits of salt, borax and nitrate. In the eastern part of the country there is sufficient rainfall to permit the growth of herbage, which is used as fodder for llamas and other animals.

**Atahualpa** (*ä'tä-wäl-pä*), the last of the Incas or rulers of Peru. He was first given the kingdom of Quito, but in a war with his brother had just obtained the rule of Peru, when Pizarro, at the head of his 200 Spanish cavaliers, marched through the country and entered Caxamarca where the Inca was encamped. By a daring but treacherous stratagem Pizarro got possession of the king, who had come by invitation on a friendly visit. While a priest was explaining the Christian religion, at a sudden signal the mysterious firearms poured death into the terrified masses of the Peruvians and the Spanish cavalry rode them down with merciless fury. Atahualpa, made a captive, agreed to pay an enormous ransom; but was accused of plotting against Pizarro, tried and condemned to be burned. On his agreeing to be baptized, his sentence was modified to death by strangling (1533). Prescott in his *Conquest of Peru* tells the story of this struggle and of the wonderful civilization of the Incas.

**Atalan'ta,** a heroine in Greek fable. She was an Arcadian, daughter of Jasus and Clymene. At her birth she was left to die on a hill by her father who had wished for a son, but was suckled by a she-bear and grew up to be a maiden huntress of marvelous courage and skill. She slew the centaurs who pursued her, sailed with the Argonauts and took a prominent part in the chase of the Calydonian boar. She was the swiftest of mortals, and having many suitors, offered to marry the one who should outstrip her in a race, the penalty of defeat being death. At length she was beaten by stratagem. Meilanion got from Venus three golden apples, which he dropped one after another during the race; and Atalanta was so charmed by their beauty that she stooped to pick them up and so lost the race. They were both later changed into lions. Her story has been put into poetic form by Swinburne in his *Atalanta in Calydon.*

**Atchafalaya** (*ăch-ăf-ä-lī'ä*), a river of Louisiana or, more properly, an outlet of the Red River. It flows southward to Grand Lake, and after passing through it reaches the Gulf of Mexico by Atchafalaya Bay after a course of 160 miles. Its name means lost river, and it is supposed to have once been the bed of the Red River.

**Atch'ison,** a city of Kansas, on the left bank of the Missouri River, 333 miles above St. Louis. It is an important railway center, nine distinct lines converging there. The city has flour mills, an iron foundry,

and machine, furniture, carriage and wagon shops. St. Benedict College, St. Scholastica's Academy (R. C.), the Midland College (Lutheran), the Atchison Latin School, and excellent public and parish schools are in the city. Besides, there are an orphans' home, an insane asylum, a hospital and three parks. The city has grown rapidly. Its population is 16,429.

**Athabas'ca,** a former district in northwest Canada, now has the status of a province, and is known as Alberta.

LAKE ATHABASCA, partly in Alberta and partly in Saskatchewan (Canada); area 2,842 miles. River of the same name, 765 miles long, flows into this lake. A considerable stretch of it navigable. Athabasca Landing, a place of some commercial importance, is on its banks. The Athabasca is the most southerly of the rivers that go to make up the Mackenzie basin. It has its source in Yellow Head Pass high up in perpetual snow. It flows easterly and northerly collecting in its course the waters of the Baptiste, Macleod, Freeman, Pembina, Lesser Slave and other streams. It is one mile wide where it empties into Lake Athabasca (Lake of the Hills), and 1,100 miles from its source high up in the Rockies.

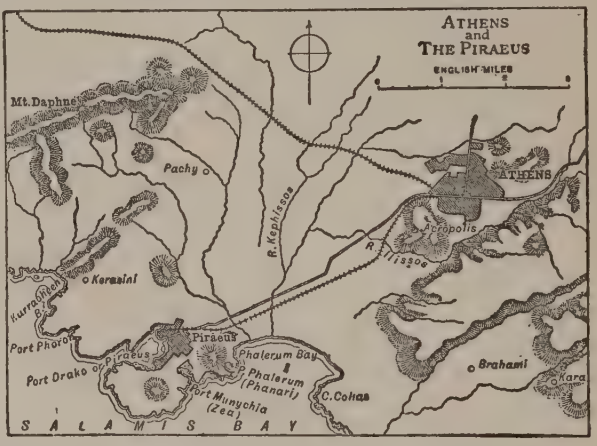
**Athaliah** (*ăth-ā-lī'ā*), the daughter of Ahab, king of Israel, married Jehoram, king of Judah, and brought the worship of Baal into Judah. After the death of her son, Ahaziah, who succeeded Jehoram but reigned only one year, she tried to pave her way to the throne by destroying all the members of the royal family. But Ahaziah's son, Joash, was hidden by his aunt, and after Athaliah had reigned six years, the high priest, Jehoiada, placed Joash on the throne and caused Athaliah to be killed. Handel, in an oratorio, has told this story, and Racine also, in his drama *Athalie*, for which Mendelssohn composed the music.

**Athena.** See MINERVA.

**Ath'ens,** the capital of Attica and the center of ancient Greek culture. The city is beautifully situated. In its center is the rocky height called the Acropolis, rising about 500 feet above the Attic plains; and grouped around it are the Areopagus or Hill of Mars, the Museum or Hill of the Muses, the Hill of the Pnyx and the Hill of the Nymphs. The river Ilissus can be seen to the north and east, and the Cephissus to the south and west, while the Attic plain is itself girdled by hills.

In legend Athens dates back to the hero Cecrops, from whom the city was called Cecropia, as well as the far more famous name, Athens, in honor of its patron goddess, Athena. The mythic King Theseus also plays an honored part in the forming of the early city; while under the hands of Solon and the tyrants Pisistratus and Clisthenes was formed that democratic government which made the city so famous in history, and beginnings were made in the erection of imposing buildings. The ruins of the colossal temple to Zeus, called the Olympium, date back to this period.

During the Persian wars the city was abandoned and burned, but after the




victories of Salamis and Platæa, it was splendidly rebuilt and the Athenians entered upon the most brilliant epoch of their career. The energy of Themistocles secured the building of the walls around the Acropolis, and the city walls, about five miles in circumference, with their ninety-seven towers and ten gates. Just outside one of these gates was the Ceramicus or burying-ground, where are still to be seen beautiful tomb bas-reliefs. The fortification of the harbor, called Peiræus, and the building of the famous "long walls," 500 feet apart, some years later, completed the defenses of the city.

The age of Pericles was the most glorious in the history of Athens. Then flourished Monesicles and Ictinus in architecture, Phidias and Myron in sculpture, Æschylus and Sophocles in tragedy, Socrates and Plato in philosophy, Herodotus and Thucydides as historians and Pindar and Simonides as poets. In this period many of the finest buildings of Athens were built—the Parthenon, considered the most beautiful ruin in the world, the Erechtheum, the Temple of Wingless Victory, the Theseum and many other temples and monuments. At that time the city had more than 10,000 dwellings and 100,000 free inhabitants, with at least twice as many slaves.

The close of the Peloponnesian War marked the fall of Athens. Her splendid

walls were destroyed and her civic spirit was broken; but a few men such as Demosthenes still kept her the defender of Greek freedom, while Lycurgus laid out the Stadium for the grounds of the so-called Panathenaic festival, having seats for 45,000 persons. After Athens with the remainder of Greece had fallen under the power of Macedonia, it became the seat of schools of philosophy and rhetoric, and later, when it became a Roman province (146 B. C.), it for a long time taught its conqueror. During this period the Emperor Hadrian gave the city a new prosperity; but from this time onward Athens became the spoil, first of the Romans, then of the Goths, afterward of the Christians and lastly of the Turks. In 1833 Greece was freed from the Turks, and since that time Athens, as the capital of the kingdom, has grown rapidly. It has a gymnasium after the German model, a school for the education of girls, a polytechnic school which provides instruction in painting, sculpture and mechanics, and a university, which numbers over fifty professors and nearly 3,000 students. Within recent years there has grown up in Athens a great interest in the study of the remains of antiquity; and the three museums are stored with the fruit of such work. Besides the native societies for this object, called archeological societies, America England, Germany and France have established similar schools. The American school was founded in 1882, and is maintained by twelve leading colleges in the United States. The population of Athens is now 167,479.

**Athens, Ga.,** the capital of Clarke County, north central Georgia, on the Oconee River, is seventy-three miles northeast of Atlanta. It is a center of the Georgia cotton-trade, and has a number of cotton-mills and other manufactories. It is the seat of the University of Georgia, the State College of Agriculture, the State Normal and of Lucy Cobb Institute. The city is an important railway junction, and fifty miles to the eastward it has the facilities of the Savannah River. Population, 14,913.

**Athletics.** The indulgence in games and sports is as old as the era of Homer. Quite respectable amateurs were Plato, Cleanthes and Pythagoras, though they did not rival, of course, the trained professionals who won the bay and the olive leaf at the great Olympian, Pythian, Nemean and Isthmian games. In the days of old King Hal of England, sport and games in the mother country were universal. The chief features in these contests and rivalries were archery, running, jumping, leaping, wrestling and boxing matches, together with remarkable records in putting shot and throwing the hammer. At a later day came the school sports at Eton, Harrow, Rugby and Shrewsbury, the athletic contests at Oxford and Cambridge, including sculling matches on the rivers and the Highland games at Braemar, Inverness and other towns in Scotland. In our modern day athleticism has become almost a craze, with its swimming, skating, bicycling, baseball, football, boxing and cricket matches, croquet and lawn tennis championships and boat and hurdle races. To-day the physiology of bodily exercise is better understood and valued than ever before, and hence come the methodical training indulged in and its results in the healthful nutrition of the body and its beneficial effects on the respiratory organs and the stimulus to the brain and all the bodily powers.

Those who practice athletics fall into three classes, consisting of amateurs, professionals or semi-professionals. All train, that is, make particular preparation for special sports, but amateurs do not compete for money, receive pay for services nor contest against professionals. For many years athletics in America consisted of contests between isolated colleges or clubs, but about 1875 these began to form groups, train methodically, play series of games and hold large meets. Now a network of athletic associations covers the civilized world, including even colonies in uncivilized countries, and codes of play regulate every imaginable condition and happening in any game. The United States has an Amateur Athletic Union (A. A. U.) and an Intercollegiate Association of Amateur Athletes. The professional associations are too many to name, the best known being the American and National leagues of ball-clubs.

Training for athletic games has been reduced to a science. It regulates bathing, clothing, diet, exercise and sleep; begins months before an "event" occurs; and often is as severe as if the athletes were soldiers. A cold bath should be taken every time after practice and be followed by vigorous rubbing with a rough towel. Clothing usually consists of a shirt, knee-trousers, thick stockings, rubber-soled or light-leather shoes for road-running and a blanket or sweater to wear after exercise and prevent catching cold. Proper diet is indispensable—wholesome, well-cooked food in plenty—but drink, heavy foods, rich pastries and tobacco are forbidden. Exercise should not be confined to the practice that the special contest requires, but whatever develops all-around power and skill helps on the special thing. Regular hours of sleep and at least eight hours a night are indispensable. The more important games are described in special articles. See BASEBALL, BASKETBALL, CROQUET, GOLF, TENNIS, etc.

**Ath'os, Mount,** called Monte Santo or Holy Hill by the Italians, a famous mountain in Greece, at the extremity of the peninsula of Chalcidice, on the Ægean Sea. It rises to the height of 6,346 feet above the sea. In ancient times several towns were built on the peninsula. Xerxes cut a canal through the isthmus which connects the peninsula with the mainland, to escape the dangerous passage around the promontory; traces of the canal still exist. The peninsula is celebrated as the seat of a kind of monastic republic, consisting of twenty large monasteries besides numerous hermitages and chapels. The entire number of monks is about 6,000. The whole community is governed by four presidents, one of whom is called the First Man of Athos, and a holy synod of twenty members. The monks lead an ascetic life, living on herbs, fruit and fish. They spend their time in farming, gardening, the care of bees and the manufacture of amulets, images, crucifixes and wooden articles of furniture, which they sell.

**Atlanta, Ga.,** the capital of the state and county seat of Fulton County, through which county the Chattahoochee River flows. It lies 170 miles west by north of Augusta and about 295 miles northwest of Savannah, both of the latter cities being on the Savannah River, Atlanta, frequently called the Gate City, is an important railroad and commercial center; it is on the Southern, the Seaboard Air Line, the Atlanta & West Point and other railroads. It occupies high ground, and has a mild, equable climate. The city, which was founded in the year 1837, when for some few years it was known as Marthasville, received its charter as a city in 1847, and in 1878 it became the state capital. During the Civil War it played a prominent part as a rallying point and supply center for the Confederate armies, and as such was for several weeks in 1864 invested and finally captured by the federal army under General Sherman, the city being at the time held by the Confederate General Hood, who was compelled to evacuate it after two sanguinary battles had been fought in the vicinity. Later in the year Sherman withdrew his army and started on his march to the sea, when the city was almost totally burned. After the close of the war Atlanta was speedily rebuilt, and in 1895–96 it was chosen as the site of the Cotton States Industrial Exposition. The new city has been substantially and attractively built and besides its civic and municipal buildings it is adorned with a handsome state capitol, together with a number of important educational institutions, including Atlanta, Oglethorpe, Emory and Clark Universities, State School of Technology, Atlanta Baptist College, two Medical Colleges, the city's training institutes and Georgia Military Academy. It has, moreover, a large and growing number of industrial establishments, including agricultural implement works, machine-shops, foundries, cotton and paper mills, tobacco factories, etc. The city has made progress since the Civil War. Is now one of the busiest and most flourishing cities of the New South and is still enjoying a solid and rapid growth. Population, 200,000.

**Atlanta University.** A non-sectarian institution founded in 1869 for the education of colored men and women. It is situated in Atlanta, Ga., and in 1910 had 400 students. The president is Horace Bumstead, D. D. The aims of the university are stated to be "to train talented negro youth to disseminate civilization among the untaught masses, and to educate teachers."

**Atlantic City, N. J.,** a popular and fashionable seabathing resort on the New Jersey coast, situated sixty miles southwest of Philadelphia. On account of its salubrious climate it is both a winter and a summer resort. It has an admirable beach, and is frequented both summer and winter by thousands of people from Philadelphia, New York and from all sections of the country. Magnificent express trains, both steam and electric, are run daily between Philadelphia and Atlantic City, while trains are run direct from New York, Pittsburg, Washington and the south. The city is lighted by electricity, the principal streets are asphalted and the electric street car service is of the best the country affords. There are upward of one thousand hotels and boarding houses, some of these being the largest and best equipped on the Atlantic coast.

The Board-walk along the ocean front is over eight miles in length and is sixty feet in width. There are thirteen school buildings, large and convenient churches, numerous halls, magnificent ocean piers and amusement places of all descriptions. The resident population is over 51,000, and the assessed valuation of the resort over ninety-two million dollars.

**Atlan'tic Ocean,** so called either from Mt. Atlas or from the fabulous island of Atlantis, which separates the old from the new world. Its greatest width is about 5,000 miles; but between Brazil and the African coast the distance is only about 1,600 miles. It is in open communication both with the Arctic Ocean and the Antarctic or Southern Ocean. The average depth is between two and three miles, though in places it is twice that depth. It has been sounded in all directions, and it has been found that as a rule the bed of the ocean is a broad, gently undulating plain, though near some of the continental

shores and around some of the volcanic cones which rise from this floor there are very steep slopes. Life exists at all depths of the sea, though becoming less abundant at greater depths; while the surface waters from equator to poles swarm with all kinds of plants and animals, many of which give forth a phosphorescent light, causing what is known as the luminosity of the sea.

Though only about half as large as the Pacific Ocean, the Atlantic is much more important, as the most civilized nations of the world live on its shores and it is the great highway of trade for the world. Its coasts are better surveyed and better provided with lighthouses than those of any other ocean. It is divided by the equator into the North Atlantic and South Atlantic, with respective areas of 14,000,000 and 10,000,000 square miles. It is estimated that the yearly discharge of rivers into the Atlantic is 3,400 cubic miles of water, equal to about one half of the river discharge of the world.

There are warm and cold currents in the Atlantic, which have an effect on the neighboring lands. The most important is the Gulf Stream. It starts from the Gulf of Mexico and spreads out over the ocean to the south of Newfoundland; one part of it returns to the tropics off the coasts of Spain and Africa; the other passes northward between the British Isles and Iceland and on to the coasts of Norway, which are thus rendered habitable, though the opposite coasts of Greenland are ice-bound.

The chief inlets of the Atlantic are, on the west, Baffin Bay, Davis and Hudson Straits, the Gulf of St. Lawrence, Gulf of Mexico and Caribbean Sea; and on the east the North and Baltic Seas, Bay of Biscay, Strait of Gibraltar and Gulf of Guinea. The principal islands washed by the ocean are, on the west, Newfoundland, Bermuda, Bahama and West India Islands, Trinidad and the Falkland Islands; and on the east, Iceland, Faroe, Shetland, Orkney and the British Islands, the Azores, Madeira, Canary and Cape Verd Islands, together with St. Paul, Ascension and St. Helena. Some twenty cables now cross the Atlantic floor between the Old World and the New; while the Marconi wireless system, now successfully inagurated, adds to the facilities of international communication.

**Atlan'tis,** in ancient tradition the name of a vast island in the Atlantic Ocean. Plato relates, in his dialogue *Timæus*, how an Egyptian priest told Solon of its existence, lying off the Pillars of Hercules in the ocean and larger than Libya and Asia Minor together. Plato also gives a description of the island and adds a fabulous history. His story is that 9,000 years before his own time Atlantis was a powerful and populous island, and conquered the western part of Europe and Africa. At one time its whole power was arrayed against the nations bordering on the Mediterranean, and every nation gave way before it except the Athenians, who were finally victorious. The gods at last came to the rescue of the earth and an earthquake caused the island to sink in the ocean. Many efforts have been made to find the seat of this island, but it doubtless was only an imaginary land, like the Land of the Dead among the Celtic race.

**At'las,** in Greek fable, the son of a Titan and father of the Pleiades and Hyades. As leader of the Titans he tried to storm the heavens, and for this crime was condemned by Zeus to bear the vault of heaven on his head and hands, standing in the neighborhood of the Hesperides at the western end of the earth on the mountains in the northwest of Africa, still called by his name.

**Atlas,** the great mountain system of northwestern Africa, stretching from Cape Nun in Morocco to Cape Bon in Tunis, a distance of about 1,400 miles. It is a very irregular mass of mountains running in various directions. It reaches its greatest height (about 13,000 feet) 27 miles southeast of the city of Morocco, and in the peaks Bibawan and Tagherain. The heights approach the sea and form the promontories jutting out into the Atlantic. The slopes of the north, west and south are covered with vast forests of pine, oak, cork, white poplar, etc Copper, iron, lead and antimony are found abundantly, but have not yet been mined to any great extent.

**Atoll** (*ă-tŏl'*), the native name commonly applied in the Indian Ocean to a lagoon island, a low, usually circular reef, often composed of coral and the sand and soil washed up by the sea, and upon which a stunted vegetation grows, with an occasional palm tree a variety of shrubs. Many atolls are as much as a hundred miles in circumference, and enclose bodies of water varying from 12 to 50 fathoms; they furnish good temporary harbors, open here and there, by narrow inlets from the sea. In many cases they are inhabited by Malays. See CORAL ISLAND and REEF.

**At'om.** When a homogenous body is broken up into very small parts, even the smallest parts which we can produce by any instrument or see by any microscope, these parts appear to be all exactly alike in structure. But we may fairly ask whether, if it were possible to continue the process of division yet further, we should still find the body made up of parts exactly alike. The facts indicate that this question would have to be answered in the negative. For there are other methods, besides the use of mechanical instruments, for separating a

body into its parts. Thus, for instance, if we place zinc in dilute sulphuric acid, the zinc will set free hydrogen, which formerly constituted a part of the sulphuric acid. The sulphuric acid has thus been divided into parts. Again, if we confine a mixture of gases in a vessel with porous walls, we find that some of these gases pass through the walls more rapidly than others; and that by collecting those that come through first and those that come through last, we can separate the mixture into parts that are very different from one another. From considerations of this kind we are led to think that matter is made up of particles far transcending in smallness the reach of the most powerful microscope. *The smallest mass of any substance in which the properties of the substance still remain is called a molecule.* But all substances, except about ninety which are called elements, have been decomposed into other substances having different properties. *The smallest mass of each of these elementary substances is defined as an atom.* Atom is a Greek word meaning "indivisible;" it acquired its present English signification about the beginning of the 19th century.

An atom is defined as a portion of matter which is indivisible by chemical methods: but there are excellent reasons for thinking that this atom which is indivisible by chemical methods is made up of still smaller parts. One of these reasons is that a single type of atom—say hydrogen—is capable of emitting light of many different wave lengths, just as a piano or an orchestra can emit many different wave lengths of sound. And just as a piano is a complex instrument, so we are led to think that an atom of hydrogen—or indeed an atom of any other substance—is probably a very complex mechanism. A still stronger reason for thinking that the chemical atom is divisible is th fact that Sir Joseph Thomson has recently succeeded in splitting off, from the hydrogen atom, parts which are called "electrons" and which have a mass of approximately one two-thousandth that of the hydrogen atom. These electrons may be obtained from matter by other processes also, such as X-rays, ultra-violet light, and high temperatures. One investigator has estimated that the size of an electron bears to the size of an atom about the same relation as the size of a pinhead bears to the size of the dome on St. Paul's Cathedral.

In all, there are about ninety kinds of atoms: these are the "elements" of the chemist. Professor Millikan of Chicago University has found the mass, in grams, of a hydrogen atom to be $1.62 \times 10^{-24}$.

Experiments indicate that it would require about 100,000,000 average molecules laid side by side in a straight line to cover a distance of one centimeter.

See Sir Joseph Thomson's *Corpuscular Theory of Matter* (Scribners), Soddy's *Interpretation of Radium*, Cameron's *Radium and Radioactivity* (Romance of Science Series), Kimball's *Properties of Gases* (Houghton Mifflin Company). HENRY CREW.

**A'treus,** according to the Greek legend, the son of Pelops and Hippodamia. By some versions he is accounted the father of Agamemnon and Menelaus, while others say he was their grandfather but that he reared them as sons. The whole story of the house of Atreus is one of bloodshed, the series of crimes beginning with the murder of Chrysippus by his half brothers, Atreus and Thyestes, and ending with the murder of Clytemnestra and her husband by Clytemnestra's son, Orestes. Because of the first murder, Pelops pronounced the curse upon his sons that they and their posterity should perish by means of one another.

**At'tar of Roses** (from the Arab word for *perfume*), the oil extracted from the petals of the rose. It is prepared from rose-water in Persia, India and other eastern countries by setting it out during the night in large open vessels, and early in the morning skimming off the oil which floats at the top. It is very costly, and is often adulterated with sandalwood and other oils. Half an ounce of the oil can be made from 200,000 well-grown roses, and this amount, when manufactured, is worth about $40. The oil is at first colorless, but later shows a yellow tint. The oil of Adrianople and of Ghazipoor in Hindustan is considered the best. The region about Ghazipoor is one great expanse of roses.

**At'tica,** one of the divisions of ancient Greece, with Athens as its capital. Its area was about 640 square miles. It is of the shape of a triangle, having its northeast and southwest sides washed by the sea, and joined to the mainland on the north. As early as the time of Solon it was well cultivated, and produced wine and corn. Figs, olives and grapes are still grown, and goats and sheep are raised. Today Attica and Bœotia together form a division or government in the kingdom of Greece, with an area of 2,472 square miles and a population of 341,247.

**At'tila,** the Scourge of God, born about 406 A. D., was son of the king of the Huns, and in 434 succeeded his uncle as king of countless hordes scattered over the north of Asia and Europe. He was regarded by the Huns with reverence but by the Christians with dread. He is said to have received the title Scourge of God from a hermit in Gaul. His power at one time reached from the Rhine to the frontiers of China. In 447 he laid waste the entire region between the Black Sea and the Mediterranean. All the people, it is related, were either destroyed or forced to follow

him against his enemies. The Emperor Theodosius was completely defeated by him, and seventy large cities were destroyed. A few years later, in 451, Attila marched westward against Gaul. There he was met in the valley of the Marne by Theodoric, king of the Visigoths, and by Aëtius, leader of the Romans. After a terrible battle, Attila was completely defeated and barely escaped with his life. The old historians speak of the battle as one of the most bloody the world ever saw, and it was of the greatest importance, because it prevented the inferior races of the east from destroying the beginnings of new civilization in the west. Not less than 252,000 men are said to have been left dead upon the field. Attila resolved to fire his wagons and cast himself into the flames rather than be taken captive, but Aëtius allowed him to retreat without harm.

The next year he made a raid into Italy, destroying many cities and driving the people into the mountains. Rome itself was saved only by the bravery of Pope Leo I, who visited Attila and is said to have so awed him by the majesty of his appearance that he gave up his intention of burning the city. He died in 453, while preparing for another attack upon Italy, from the rupture of a blood-vessel on the day of his marriage. His body was put into three coffins, the first of gold, the second of silver and the third of iron, and the men who made his grave were put to death, that no one might know where he was buried. He is described as of very short stature, with large head and flowing hair, small piercing eyes and broad shoulders.

**At'tleboro, Mass.,** an early settled and progressive manufacturing town in Bristol County, on the line of the New York, New Haven & Hartford Railroad, 32 miles southwest of Boston. Originally composed of a group of villages, Attleboro was incorporated as a town in 1694. Today it has a number of bleacheries, dyehouses, smelters, gold and silver refineries and manufactures besides jewelry and jeweler's supplies, silverware, carriages, leather, buttons, cotton goods, etc. It has a well equipped public library, owns its waterworks and is the seat of the Attleboro Sanitarium. See Daggett: *Sketch of the History of Attleboro* (Boston, 1894). Present population 18,149.

**Auburn** (*aw'bûrn*), a city of Cayuga County, New York state. Electricity from Niagara and water-power from Owasco Lake, which is within two and a half miles of the city, supply its factories with power. The city contains a state prison, Theological Seminary and two free libraries. It was long the home of William H. Seward. Manufactures include farm implements, rope, twine, engines and shoes. Population, 34,668.

**Auburn, Me.,** the capital of Androscoggin County, southwestern Maine, on two rivers of the same county name, which furnish the city with splendid water-power. It is situated about 35 miles north of Portland, and has good railroad facilities for the shipping of its special manufactures of cotton and shoes, in which trade it gives employment to some 6,000 hands. Its other industries include last, box and carriage works, machine shops, shoe findings, packing houses, etc. The city is lighted by electricity, and owns its waterworks. It has excellent public schools, at the head of the public school system being the Edward Little High School, a noted institution, a number of churches and fine public buildings. Its population at present is 17,000.

**Auck'land,** a New Zealand seaport and the chief town in the North Island. For a time it was the capital of England's colony in the South Pacific, before the choice fell upon Wellington in 1865. Auckland has a fine harbor on the Gulf of Hauraki, and possesses considerable trade, being the chief town of its provincial district of the same name. The district has an area of 25,746 square miles, with a population (exclusive of Maoris) of 264,520 in 1911, and a fertile soil and delightful climate. The city of Auckland has considerable foreign trade, chiefly with Britain; it is also the seat of a university, and with its suburbs has a population of 102,676.

**Audubon** (*aw'du-bon*), **John James,** a distinguished American ornithologist, was born in 1780 in Louisiana. He was educated at Paris, his parents being of French origin. After returning to America, he married and went to live on his plantation. He spent his time wandering through the

woods, watching the habits of birds. Often he was gone for months entirely alone, in absolutely uninhabited regions. The varieties of birds which he observed he sketched at once.

After about fifteen years of such excursions, he proceeded to Philadelphia with his designs, intending to publish a work on the birds of North America. But while he was gone from the city all his papers were destroyed by rats, and he was obliged to go back to the forests and begin his work again. Four years later he took his new designs to England and in 1830 appeared the first volume of *The Birds of America*, containing 100 plates. In 1839 the work was completed, and at the same time was published a description of American birds to accompany the volume of plates. Audubon published another book in 1846–50 on the quadrupeds of America. He died at New York, January 27, 1851.

**Audubon Societies,** organizations formed in over thirty states of the American Union, with about 75,000 members, for the study as well as the protection of bird-life. These societies have waged their battle for birds along many lines and with gratifying results. Through their literature and through the newspaper and magazine press they have awakened a wide interest in behalf of the birds, they have enlightened the public in regard to the æsthetic and economic value of birds; they have enlisted the interest of teachers in the public schools and through them have created in the minds of the young a love of birds and bird-lore; they have secured the enactment of laws forbidding the slaughter of birds and have practically stopped the trade in bird plumage. In cooperation with the federal government they have purchased and set aside as refuges, safe from depredation, many of the islands used as breeding places by various species of seafowl along the Atlantic and Gulf coasts and in certain points in Oregon and Washington. A warden is placed in charge of each of these whose business it is to patrol the refuge and see that the birds are protected from trespassers. In order that he may have the prestige and authority of a government officer, the federal government pays him a salary of one dollar a month, but his real salary is paid by the Audubon societies. Pelican Island, in Florida, the first bird reservation, was set aside by proclamation of the president in March, 1903. This island is the only known breeding place for brown pelicans on our Atlantic coast, and the colony had been almost exterminated when the government interfered. Here and in other reservations where many species of wild fowl, including grebes, coots, rail, white ibises, egrets, heron, etc. make their winter homes, these beautiful birds are now rapidly increasing in number. Much similar work is carried on by state organizations. In Louisiana the state Audubon Society controls 750 square miles of land and water on the east side of the Mississippi River near its mouth and a similar tract of territory on the west side. Massachusetts, New Jersey and other states have secured extensive tracts in which wild birds are to be protected. It is probable that ere long similar action will be taken by every state in the Union.

In 1903 the Audubon Societies east and west secured agreements with the Merchants' Millinery Association and the Western Jobbers' Association whereby the sale of the plumage of wild birds was discontinued. It is stated on the authority of the government Bureau of Ornithology that bird life in this country, which during the fifteen years preceding 1903 had been reduced fifty per cent. by the merciless slaughter of birds for their plumage, is now slowly but steadily on the increase, thanks to the vigorous legal measures and the awakening of public sentiment which have resulted from the work of the Audubon Societies.

**Auerbach, Berthold,** German novelist, was born of humble Jewish parents at Nordstetten, in the Black Forest, Germany, February 28, 1812, and died at Cannes, France, February 8, 1882. After passing through the universities and getting into trouble with the authorities for participation in the Burschenschaft, he, under the influence of Spinoza's teaching, renounced Judaism and gave himself to literature. He published a *Life of Spinoza* and one (unacknowledged) on *Frederick the Great*, but made no special success until 1843, when the first of his now famous *Black Forest Village Stories* appeared, followed at some interval by *Little Barefoot*, *Joseph in the Snow*, *Edelweiss*, *The Villa on the Rhine* and by *On the Heights*—the latter two being, with his sketches of the Black Forest, his most representative work. His subsequent work included further novels, *Brigitta*, *Aloys Walfried* and a later series of village stories of the Black Forest, with some admirable delineations of peasant life and character.

**Augs'burg,** an old and important city of Germany, in Bavaria, is on the River Lech. A colony was planted here in 12 B. C. by the Emperor Augustus. It became a free city of the empire in 1276. Holbein was a native of this city. It has many large manufactories, and is one of the main money markets of Europe. Population, 102,293.

**Augur,** a Roman soothsayer or diviner who professed to foretell events by the flight of birds or other omens. His office was held in high repute by the heads of the state, who rarely undertook any project of importance without first consulting

the auguries. The augur among the Romans held his office for life; at one time there were but two (generally patricians); but later their number was increased to nine and even more.

**Au'gust,** the sixth month in the Roman year, which began with March. It was originally called Sextilis, and received its present name in honor of the Emperor Augustus, because several of the most important events of his life occurred in this month. In this month he was first elected consul and three times entered Rome in triumph; in the same month an end was put to the civil wars. To make it equal to the fifth month, a day was taken from February and added to August.

**Augus'ta,** county seat of Richmond County, Georgia, a city of 41,040 inhabitants, situated at the headwaters of the Savannah River. It was laid out by Oglethorpe, the founder of the state, in 1735 as a trading post for the Indians. It became a point of historic interest and military importance during the Revolutionary War, was visited by Washington in 1792 and by Lafayette in 1825. It is beautifully laid out in wide streets and avenues, noted for their regularity and abundance of shade trees. Greene Street, the main residence street, is 170 feet wide, with a park in the center, the length of the street, shaded with a double row of stately trees. The Augusta canal, nine miles long, developing 14,000 horse power, is one of the widest and deepest in the entire county. It was built and is owned by the city, and furnishes water-power for a dozen large cotton mills. Milling and cotton selling are the main industries of the city. The factory population numbers 15,000. The capital employed is about $6,000,000, running 9,000 looms and 300,000 spindles. Besides these, there are large iron foundries and railroad shops, Augusta is well equipped with hospitals, orphan asylums, electric car lines, parks and public schools. It is a favorite winter resort for northern tourists, having a fine winter hotel, The Bon Air. Its soft climate, beautiful situation and enterprising and hospitable people make it an attractive place for industrial pursuits as well as for social pleasures.

**Augusta,** the capital of Maine, on the Kennebec River, 43 miles from its mouth. The city lies on both sides of the river, which is spanned by a bridge 520 feet long. The white granite statehouse is one of the finest in New England. Other fine buildings are the courthouse and the Maine insane asylum, to which property has been added the U. S. arsenal grounds. The United States arsenal is on the east side of the river, and the national military asylum is just outside the city limits. A dam, 1,000 feet long, above the city supplies an immense water-power. The chief interest is lumber, but the city has cotton mills, pulp and paper mills and large publishing houses. Because of Augusta's position among the hills of the Kennebec and her lakes and ponds it has become quite a summer resort. Population, 13,211.

**Augustine** (*aw'gus-tĭn*), **Saint Aurelius,** a famous preacher and scholar, was born at Tagaste, near Carthage, Africa, November 13, 354 A. D. He had the best of schooling, the latter part of it at Carthage, where he fell into bad habits. A passage of Cicero, which he chanced to read one day, first stirred his deeper being into life. For the next ten years he was an earnest student of philosophy. In 383 he went to Milan Italy, as a teacher of rhetoric. Here he became a close friend of the eloquent preacher, Ambrose, then bishop of Milan. Augustine often went to hear his friend preach. His mother, Monica, was an earnest Christian, and her influence and that of his friend brought him to accept Christianity. In 396 he was made bishop of Hippo in North Africa. The next year he brought out his *Confessions*, some passages of which for beauty can only be compared with the *Psalms* of David. His most powerful work is his *City of God*. A great thinker and writer, no man's influence on the church has been greater. He died in 430 A. D.

**Augus'tus, Gaius Julius Cæsar Octavianus,** the son of Octavius and Atia (the niece of Julius Cæsar), was born September 23, 63 B. C. In early youth he was adopted by Julius Cæsar as his son and heir. At the time of Cæsar's assassination, Augustus was a student under the celebrated orator Apollodorus in Illyricum. He returned to Italy, assuming the name Julius Cæsar Octavianus, and on his landing at Brundusium was welcomed by deputies from the veterans there assembled. Augustus was at first haughtily treated by the consul, Mark Antony, who refused to surrender the property of Cæsar. After some fighting, in which Antony was defeated and had to flee across the Alps, Augustus, who had made himself a favorite with the people and the army, succeeded in getting the will of Cæsar carried out. When Antony returned from Gaul with Lepidus, Augustus joined them in establshing a triumvirate. He obtained Africa, Sardinia and Sicily. Antony obtained Gaul, and Lepidus Spain. Their power was soon made absolute by the massacre of those unfriendly to them in Italy and by victories over the republican armies in Macedonia under Brutus and Cassius. After the battle of Philippi, won by Augustus and Antony, the triumvirs made a new division of the provinces—Augustus obtaining Italy and Lepidus Africa. Shortly afterward, the claims of Lepidus and Sextus Pompeius having been settled by force

and fraud, the Roman world was divided between Augustus and Antony. While Antony was lost in luxurious dissipation at the court of Cleopatra, Augustus was striving to damage his rival in public estimation. At length war was declared against the queen of Egypt, and at the naval battle of Actium, B. C. 31, Augustus was victorious and became sole ruler of the Roman world. Soon after, Antony and Cleopatra ended their lives by suicide. The subsequent measures of Augustus were mild and prudent. He abolished the laws of the triumvirate, adorned the city of Rome and reformed many abuses. The title of *Augustus*, meaning consecrated, was conferred upon him as consul. In 12 B. C., on the death of Lepidus, he had the title of Pontifex Maximus or high priest conferred upon him. He died August 19, A. D. 14. He so beautified Rome that it was said: "Augustus found the city built of brick, and left it built of marble." He encouraged agriculture and patronized the arts and literature. Horace, Vergil and all the most celebrated contemporary Latin scholars and poets were his friends. His was the famous *Augustan Age* of Latin literature.

**Auk,** the name applied to a family of webfooted sea-birds. They have a thick-set, heavy body with short wings and tail. They are seldom more than a foot long, dark colored above and white beneath. They live almost exclusively in the water

GREAT AUK

and visit the land only to lay eggs and breed. Their movements on land are very awkward, which is caused because their legs are set far back. They are fine swimmers and divers, using their wings as well as their legs when under water. The razor-bill and the so-called little auk are common in high northern latitudes, and are used by the Esquimaux for food, while the skins are used in making clothing.

The most noted as well as the largest member of the family, is the great auk, which has become extinct by the hand of man within the last fifty years. This bird, about the size of a goose, was formerly abundant on both shores of the Atlantic in north temperate parts, not, as is commonly supposed, in the Arctic Ocean. The wings were so short as to be useless for flight, and the birds stupidly allowed themselves to be knocked over by seamen armed with short clubs and to be driven in large flocks on board vessels. They were used as food from the time of the discovery of Newfoundland, and later they were killed for their feathers. While once wonderfully abundant, they have become extinct, because they were ruthlessly slaughtered. Now their skins, bones and eggs bring high prices from museums and collectors.

**Auld Lang Syne,** a well-known popular song; words by Robert Burns; music derived from a book of Scottish tunes printed in the latter half of the eighteenth century.

**Auld Robin Gray,** a popular Scottish ballad, written about the year 1772, by Lady Anne Barnard, daughter of the Earl of Balcarras, whose family name was Lindsay. It was originally sung to an old Scotch tune, known as *The Bridegroom Grat*, but has been superseded by a modern air. A second part of the ballad, it is said, was written by Lady Anne, in which Robin Gray dies and Jeanie happily marries Jamie, who "lo'ed her weel," as the song portrays.

**Aumale** (*dō'mȧl'*) (Henri Eugène Philippe Louis d'Orléans), **Duc d',** fourth son of Louis Philippe of France and a general of note in the French army, was born in Paris, January 16, 1822, and died in Sicily, May 7, 1897. When a youth he took part in campaigns in Algeria, of which he became governor-general. When the Revolution of 1848 broke out, he resigned his post and joined his exiled father and the Orleanist princes in England, until the law banishing royalty was repealed in 1871. The duke then returned to France, was made a general, and president of the council of war in which capacity he tried and condemned Marshal Bazaine. Later on, a new expulsion bill passed the French legislature in 1886, and he was banished until the revocation of the measure in 1889. Meanwhile, and in spite of the decree of banishment, the Duc d' Aumale bequeathed his beautiful chateau of Chantilly, with its fine art treasures, to the French nation.

**Aure'lian, Lucius Domitius Aurelianus,** emperor of Rome, was born in

Pannonia early in the 3d century. He came from the lowest classes, but so distinguished himself in the Roman legion which he entered, that he was rapidly promoted. In the campaigns against the Goths by Valerian and by Claudius II, he became very popular with the soldiers, and when Claudius died he was proclaimed emperor in 270 by the army of the Danube, which he then commanded. Having driven the Goths beyond the Danube and defeated many German tribes, he built a long wall to protect Rome against them. One of his best-known expeditions was against Palmyra, a city ruled by the famous Queen Zenobia. He captured the city and treated the people with unexpected kindness, and refused to put Zenobia to death. After his departure, the Roman garrison which he left to guard the city was murdered by the citizens. Upon hearing of this, Aurelian returned, destroyed the city and put the inhabitants to death. Zenobia herself was carried to Rome. Aurelian then defeated an uprising of the Egyptians, and once more obtained for Rome the complete control over Gaul. He also made many improvements in the condition of the people and in the city of Rome, as well as in the discipline of the army, and was given the title of Restorer of the Empire by the senate. While on his way to attack the Persians, he was assassinated near Byzantium in 275 A. D.

**Aure'lius Antoni'nus, Marcus,** the noblest and, in personal qualities, the most attractive of the Roman emperors, was born at Rome, 121 A. D. His original name was Marcus Annius Verus. Both his father, Annius Verus, and his mother, Domitia Camilla, were of noble blood. On the death of his father, Marcus was adopted by his grandfather, who bestowed the greatest possible care on his education. When a child he attracted the interest of the emperor, Hadrian, who, when he named Antoninus Pius as his successor, stipulated that the latter in turn should adopt both Marcus, who was his nephew, and Lucius C. Commodus. In Antoninus, who was a wise and prudent ruler and a thoroughly good man, Marcus had the best of guardians. In appreciation of the advantages of his youth Marcus himself says: "To the gods I am indebted for having good grandfathers, good parents, a good sister, good teachers, good associates, nearly everything good." While he first studied rhetoric and poetry, he early abandoned these for the study of philosophy and law, having become fascinated with the Stoic philosophy as taught by Diognetus. It was from his stoic teachers that he learned so many valuable lessons—to work hard, to deny himself, to avoid listening to slander, to endure misfortunes, never to deviate from his purpose, to be delicate in correcting others. Through all his stoical training Aurelius preserved the natural sweetness of his nature and became the most lovable and saintliest of pagans. In the year 140 A. D. he was made consul, and from this period on to the death of Antoninus, in 161 A. D., he discharged the duties of his various offices with the greatest fidelity. Antoninus in his last moments left the succession to Aurelius, without naming Commodus; but Aurelius voluntarily shared the throne with the latter, who henceforth bore the name of Lucius Verus, and Rome for the first time was governed by two emperors. Before the close of 161 A. D. the Parthian War broke out and Lucius was sent to quell the insurrection; but he gave himself up to licentious pleasures and intrusted the army to Cassius, who proved an able general, and gained several victories. The empire was now beset by many dangers. A revolt broke out in the German provinces; in Rome a pestilence raged; floods and earthquakes had laid large portions of the city in ruins; and these calamities increased the terror in which the people held their savage enemies. To allay the public alarm Aurelius placed himself at the head of the Roman legions and marched against the barbarians. He conquered the rebellious tribes and made them sue for peace in 168 A. D. Lucius died in the following year. In 170 A. D. the barbarous tribes again revolted, and from this time the contest continued almost through the whole life of the emperor. Though fond of peace, he was brave and relentless in suppressing rebellion. The most famous of all his victories was the one gained over the Quadi in 174 A. D. The effect was to bring the Germanic tribes from all quarters to sue for peace. Aurelius was now called to the east, where Cassius, the governor, had rebelled and seized the whole of Asia Minor; but before he reached there he learned that Cassius had been killed. On his arrival he burned the papers of Cassius without reading them, so that he might not learn who had been guilty of treason, treated the provinces which had rebelled with great kindness, and freely forgave the nobles who had favored Cassius. On his way home he visited Egypt and Greece, everywhere showing a deep interest in the welfare of his vast empire and securing the warm regard of his subjects, who were astonished at his lenity and goodness. He reached Rome in 176 A. D. The next year he went to Germany, where the tribes had again revolted. He again was victorious in several bloody battles, but, worn out with anxiety and fatigue, he died March 17, 180 A. D. The one blot on the character of Marcus Aurelius was his persecution of the Christians, who had been misrepresented to him and whom he regarded as enemies of the empire. His *Meditations* have been

translated into English, German, French and Spanish. Several books have been written on his life and character. The best estimate of him is found in Dean Farrar's *Seekers After God.* Compare, also, Pater's *Marius the Epicurean.*

**Aurora** (in Greek *Eos*), the goddess of the morning. She was the daughter of Hyperion and mother of the winds. She loved Tithonus, for whom she obtained from the gods immortality but forgot to ask for perpetual youth. She lived with him at the end of the earth, and when he grew old, nursed him until at last his voice disappeared and his body became shriveled, when she changed him into a cricket. Aurora is sometimes represented in a saffron-colored robe, with a wand or a torch in her hand, emerging from a golden palace and ascending her chariot; and sometimes in a flowing veil, which she is in the act of throwing back, thus opening as it were, the gates of the morning.

**Auro'ra,** a city in Kane County, Illinois, on the Fox River about 40 miles from Chicago. It has a variety of manufactures, including machinery, paints, carriages, sash and blinds, silverware, cotton mills, a wheel scraper manufactory, hardware specialties, foundries, etc. The extensive shops of the Chicago, Burlington and Quincy railroad are located here. The public schools are of high grade, and it is the seat of Jennings Seminary. Aurora has 38 churches, a Carnegie Library and all the adjuncts of an up-to-date and prosperous town, and is served by four railroads. Population, 29,807.

**Aurora, Mo.,** a city of Lawrence County, on the Missouri Pacific, Iron Mountain and the St. Louis & San Francisco railroad systems, about 270 miles southwest of St. Louis. Agriculture, fruit-growing and considerable lead and zinc mining are the chief industries of the region. Besides the shipment of these products, the city numbers among its industries flour mills, foundry and machine shops. Population, 4,148.

**Aurora Borealis,** often called Northern Lights, a luminous phenomenon of remarkable beauty occurring in the high latitudes. In intermediate latitudes the aurora most frequently presents the appearance of long streamers of pale yellowish light extending from the northern part of the horizon well nigh to the zenith. But in the higher latitudes this light appears frequently as an arch or even several arches, with the summits in the magnetic meridian. These streamers and arches are in almost constant motion, appearing to oscillate to and fro or to shoot suddenly upward and then to disappear with equal abruptness.

Since the auroras rotate with the earth, it is practically certain that they are phenomena which occur in the earth's atmosphere. And since they are almost universally accompanied by disturbances of the magnetic needle and by electrical disturbances, it seems highly probable that auroras are produced by electrical discharges, as was first suggested by Franklin. These discharges occur perhaps at a height of from 50 to 100 miles, where the atmospheric pressure does not amount to more than about one one-hundredth of an inch of mercury. Air under these conditions is a fairly good conductor of electricity.

When an aurora is examined with a prism, it presents an emission spectrum which is quite unique, consisting, as it does, of some half-dozen weak lines and one strong green line. This strong line has a wave length of 5,571 tenth-meters and apparently does not coincide with an equally strong line in any known substance. Such a spectrum indicates that auroras are in the condition of a glowing gas. And it is the opinion of two very high authorities, Vogel and Hasselberg, that the spectrum of the aurora is merely a modified spectrum of air, which as yet we have not been able to produce in the laboratory.

Contrary to the general impression, the frequency of auroral displays does not increase from equator to pole, but reaches a maximum at an average latitude of about 60°. So that the northern lights are not seen so frequently in Greenland and in Iceland as in regions south of these countries.

The name *aurora borealis* is due to Gassendi, who observed a brilliant display in France in 1621.

**Aurungzebe** (*ō-rung-zāb'*), the last great emperor of the Mogul dynasty in India. He was born in 1618, and was early appointed by his father viceroy of the Deccan. Here he gained military experience and at the same time became very rich. In 1657 his father suddenly became sick, and the eldest brother seized the power; but Aurungzebe, uniting with a younger brother, defeated him and soon gained complete control. His father, who had recovered, was made a prisoner for life in his own palace. The reign of Aurungzebe was the most brilliant period in the rule of his race. The first ten years were peaceful, and the emperor showed great wisdom in providing for a famine and in putting down a rising of Hindu fanatics. The rise of the Mahratta empire broke in upon his peaceful régime. The generals sent against this new power were defeated, and Aurungzebe had to march to the Deccan and take the field himself. He remained there twenty-two years, ruling an empire which in wealth and population was probably as great as any ever ruled by a monarch. He died in 1707. He liked to be called *Conqueror of the World;* but to show that he ruled as yet but three quarters of it, he used to tear off a corner from every sheet of paper he used in his correspondence.

AURORA BOREALIS OR NORTHERN LIGHTS.

AURORA IN FORM OF DRAPERY OBSERVED AT PORT FOULKE, GREENLAND

**Aus'ten, Jane,** a famous English novelist, was born in 1775 in Hampshire, England. Her acquaintance with English literature was considerable, and she was an especial favorite with her young friends because of her ability to make up long and interesting stories for their amusement. Her first novel, *Sense and Sensibility*, appeared anonymously in 1811. Others of her works are *Pride and Prejudice Mansfield Park, Emma. Northanger Abbey* and *Persuasion.* Her works deal entirely with domestic life, and her characters are taken from the English middle class. Miss Austen is especially noted for the delicacy and aptness of her descriptions of character and life. She died in 1817. See Prof. Goldwin Smith's *Life of Jane Austen* in the Great Writers' Series.

**Austerlitz** (*as'tĕr-lĭts*), a town in Moravia, Austria-Hungary, situated on the Littawa River, is celebrated because of the victory there of Napoleon over the Russians and Austrians, December 2, 1805. After Napoleon had captured Vienna, in the middle of November, 1805, he took up his quarters with about 75,000 men, at Brünn, the capital of Moravia. The Austrian and Russian forces, about 85,000 strong, commanded by their two emperors, were at Olmütz, northeast of Brünn. The French occupied a high piece of ground, partly surrounded by swamps and woods. At about seven in the morning of December 2d, the allied forces advanced against the right wing of the French army but Napoleon ordered an instant attack on their flank, and completely defeated them after a hard contest. While part of the allies were retreating across a frozen lake, Napoleon's artillery broke the ice and nearly 2,000 men were drowned. At Austerlitz Russia and Austria lost about 30,000 men in killed, wounded and prisoners, while the French loss was about 12,000. After the battle the Peace of Presburg was signed, and the Russian emperor was forced to return to his empire.

**Aus'tin, Alfred,** English poet-laureate (1896-1913), in succession to Lord Tennyson, was born at Headingley, near Leeds, England, May 30, 1835, and educated at Stonyhurst College and at St. Mary's College, Oscott. In 1853 he took his degree at London University, and was called to the bar of the Inner Temple. In 1861 he first showed his bent toward literature by the publication of some minor poems, followed by the volumes entitled *The Human Tragedy, Savonarola, The Tower of Babel, Prince Lucifer, Fortunatus the Pessimist, The Garden that I Love, In Veronica's Garden, Lamia's Winter Quarters, England's Darling* and *At the Gate of the Convent.* A collected edition of his poems has appeared in six volumes. He never practiced law but did journalistic work as a newspaper correspondent, and critic, writing largely for the London *Standard* and *Quarterly Review*, and founding and editing for a time, in conjunction with W. J. Courthope, the *National Review.*

**Austin, Minn.,** a city, the county seat of Mower County, on Red Cedar River and on the Chicago, Milwaukee & St. Paul and the Chicago Great Western Railroads, situated about 100 miles south of St. Paul. It is the seat of the Southern Minnesota Normal College and has, besides a Carnegie Public Library, a number of fine churches, schools, city and county buildings and an attractive city park. It is the center of a fertile agricultural region, and has a growing trade, which includes meat-packing products and those of its flour mills, creameries, brick, tile and cement works, besides live stock, wheat, flax, barley, butter and other dairy products, etc. Population 9,500.

**Austin, Stephen Fuller,** son of Moses Austin, the Texan pioneer, and himself founder of the state of Texas, was born at Austinville, Va., November 3, 1793, and died at Columbia, Texas, December 25, 1836. Taking up the work of his father, who died in 1821, he obtained from the Mexican government a confirmation of the grant to his father; he built up at Austin, Texas, a thriving settlement, while he pacified those Indians that threatened trouble. In the thirties the colony became restive under Mexican rule, and he, siding with the revolutionists, was for a time imprisoned. On being liberated he actively took up arms against the Mexicans, and, calling General Sam Houston to his aid, he committed himself to the project of Texan independence. In 1835 he was a commissioner to the United States to secure the recognition of Texas, but that object was as yet distant, and he died before seeing his cherished designs fulfilled.

**Austin,** the capital of Texas, stands on the left bank of the Colorado River. The river here breaks through a range of hills upon which the city is built. On Capitol Hill stands the magnificent state capitol, built of Texas marble, at a cost of 3,000,000 acres of state land. From this point broad avenues extend north south, east and west. Austin is an important railroad point, and the market center of a rich agricultural district. It is the seat of the University of Texas, endowed and maintained by legislative grants, with 71 instructors and an attendance of 2,500 students. Here are also located St. Edward's College, St. Mary's Academy, Tillotson College and other academies and seminaries; also the state asylums for the blind, insane, and deaf and dumb. Population, 45,000.

**Australa'sia,** meaning Southern Asia, includes Australia and the neighboring islands—Tasmania, New Zealand, Papua,

New Caledonia, the New Hebrides, New Guinea and New Britain. The term is also popularly used for the Australian colonies of Great Britain, including Tasmania, New Zealand, Fiji, etc.

**Australia** (*ąs-trā'lĭ-ą*), the great island continent of the southern hemisphere, belonging to Great Britain. It lies between latitude 10° 41′ and 39° 11′ south, longitude 113° 5′ and 153° 16′ east. It is washed on the west and south by the Indian Ocean, on the east by the South Pacific and on the north by the Timor, Arfura and Coral Seas. Its greatest length from east to east is 2,400 miles, and its breadth from north to south 1,970 miles. Its area, including Tasmania, is **2,972,573** square miles. Population, in 1909, 4,374,138.

*Surface and Drainage.* The coast line is almost unbroken. Parallel with the east coast stretches for 1,200 miles the Great Barrier reef, offering but one safe opening for ships. The absence of rivers between the coast and the interior is remarkable, there being only one large river, the Murray, 2,345 miles long. The mountain ranges are on the east coast, divided into the Australian Alps, whose peak, Mt. Kosciusko, is the highest on the continent (7,308 feet); the Blue Mountains; the Liverpool Range; MacPherson Range; Herries Range; the dividing range of Queensland; the great dividing range of Victoria; the Grampians and the Pyrenees. From the head of the Gulf of Carpenteria stretches a tableland westward. A large part of the interior is a barren tract of salt or mud plains. To the north of Spencer Gulf is an area of some thousand square miles, set with lakes, the Lake District of Australia. Eyre, Torrens, Gairdner and Amadeus to the northwest are the largest. These dead masses of salt water change as the season is wet or dry; now sheets of water and now almost grassy plains.

*Climate.* The climate of Australia is healthful though subject to high temperature. The coast regions generally have a sufficient rainfall, but the interior is subject to extreme drought and large areas are practically arid.

*Vegetation.* Plant life is modified by the dryness of the climate; the trees have a scanty foliage and large areas are covered with scrubby bushes, and, in the arid regions, with a hard, coarse plant, called porcupine grass. There are forests which afford valuable timber trees, including gum, of which there are 150 species, and acacia or wattle 300 species. Palms, of which there are 24 species are found on the north and east coasts. Various fruits and vines have been introduced and produce well. There are also large areas which produce nutritious grasses, affording pasturage for immense flocks of sheep.

*Minerals.* Gold was discovered in Australia in 1851, attracting a rush of gold-seekers. Since that time the mines have produced more than $1,350,000,000. There are also rich deposits of silver, copper, tin, lead, zinc, etc.; also coal, iron, granite, marble, limestone and sandstone.

*Animal Life.* The higher orders of wild animals found in other countries are almost wholly lacking in Australia, those here found being mostly marsupials, or animals which generally carry their young in an external pouch. Of these there are more than 100 kinds, of which the best known are the kangaroo, wombat, koala, bandicoot, wallabies and opossums. Birds are in great number and variety. The largest is the emu, which is nearly as large as the ostrich, reaching a height of six or seven feet. Eagles, falcons, hawks and owls are numerous; also many kinds of parrots and cockatoos of brilliant plumage. Other birds are the pelican, Australian goose, the magnificent lyre bird, with pigeons, ducks, geese, quail, etc. Reptiles include the alligator, more than 60 species of snakes, lizards, frogs, etc.

*Native Peoples.* The natives are of a dusky, coffee-brown complexion. They are not much shorter than the average European, but are of a much slimmer and feebler build. They are mainly interested in hunting and getting food, at which they show great cunning, and they easily learn to chatter foreign languages; but outside of this limit all is blank to the Australian. His only idea of right and wrong is that each man's property is his own, wives being one item in a man's chattels. In summer they go naked; in winter they wrap themselves in kangaroo skins. They eat roots of the wild yam, the opossum, lizard, snakes, white ants, etc. The boomerang, their favorite weapon, is a flat stick, three feet long, curved at the middle, which, when thrown, jerks in a zigzag fashion and usually comes back to the thrower. They also have flint-pointed spears, shields, and stone hatchets. Before Europeans settled in the island, there were about one hundred and fifty thousand natives, but there are now less than 50,000.

*History.* It is not known just when Australia was discovered, but it is found on a French chart of 1542. A Spaniard, in 1606, passed through the Torres Strait, to which his name is given; while early Dutch explorers made known Tasmania, called at first, in honor of the Dutch governor of the East Indian colonies, Van Diemen's Land. In 1664 the states-general gave to the western part of the continent of Australia the name of New Holland; it is known also to have been visited by the mariner William Dampier. It was not until 1768, however, that the country became really known to the English. It was visited in that year by an

AUSTRALIA
SCALES
Statute Miles, 240 = 1 Inch.
0 50 100 200 300 400 500
Kilometres, 386 = 1 Inch.
0 50 100 200 300 400 500 600 700 800
Rand, McNally & Co.'s New 11 x 14 Map of Australia.
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INDIAN OCEAN
ROTTI I.
BATHURST ISLAND
MELVILLE I.
C. Fourcroy
Port Darwin
Clarence Str.
Van Diemen Gulf
Bynoe Harbour
Port Patterson
Point Blaze
Palmerston
PERON IS.
C. Ford
Adelaide
Howley
Brocks Creek
Cape Hay
Queens Channel
Fitzmaurice R.
SEALY RANGE
Victoria R.
Daly R.
Burrundie
C. Londonderry
Cape Ruhlieres
C. Talbot
C. Bougainville
Admiralty Gulf
Cape Voltaire
Montague Sound
Bigges I.
York Sound
Brunswick Bay
Coronation R.
Augustus I.
Expedition R.
Buccaneer Archipelago
Collier Bay
Cambridge Gulf
Ord R.
Port Warrender
Prince Frederic's Harbour
Lacepede Is.
C. Leveque
Carnot Bay
Broome
Roebuck Bay
C. Latouche Treville
Lagrange Bay
Lagrange
C. Bossut
Dampier Land
King Sound
Lennard R.
Derby
Yeeda Sta.
Hickes Spring
Fitzroy
Fitzroy River
Halls Creek
Durack R.
Ord R.
Adolphus I.
Wyndham
MT. HORACE
KING LEOPOLD RANGE
CONNAUGHT RANGE
Aulas
ALEXA
NORTHER
Kimberley
Goldfield
ST. GEORGE RANGE
SANDY DESER
Shelborough
Pt. Larry
Port Hedland
Cape Thouin
Eighty Mile Beach
Dampiers Archipelago
Legendre I.
Joanna Spring
Soda Spring
Salt Sea
Lady Edith Lagoon
Florence Spring
Salt Lake
Luca Lake
Waterloo Wells
Spring
Helena Spring
Detrey R.
Detrey Sta.
Marble Bar
Pilbarra Goldfield
Nullagine
Cangan
Monte Bello Is.
Barrow I.
Thevenard I.
Mcuron I.
North West Cape
Roebourne
Erlia
Forrescue
Pilbarra
Robe R.
Fortescue River
Ophthalmia Range
Hamersley Range
Mt. Wall
Mt. Bruce
Mt. Palgrave
Yannarie
Harley
Mt. Governor
Brennahuis
Barlee Range
Pt. Cloates
Pt. Anderson
C. Farquhar
Lyndon R.
Minilya R.
Salt Lake
Cape Cuvier
Carnarvon
Gascoyne R.
Yarramel R.
Bernier I.
Dorre I.
Naturaliste Channel
Dirk Hartog I.
South Passage
Edel Land
Gantheaume Bay
Wallaby Group
Houtman Rocks
Easter Group
Pelsart Group
Beagle Is.
Jurien Bay
Wedge I.
Geographe Channel
Mt. Augustus
Top Camp
Lyons River
Teano Range
Mt. Gascoyne
Nungamarra
Mt. Padbury
Peak Hill
Mt. Sabeli
Pandara
Mt. Hale
Mindura
Mt. Hall
Gladstone
Mt. Narrien
Hamelin Pool
Noonaeragooda
Mt. Curious
Murgoo
Ballinyoo
Austin
Nougal
Mainland
Lake Austin
Warramboo
Geraldine
Northampton
Lynton
Yalgoo
Coorang
Morrum
Salt Lake
Pindar
Gullewa
Mullewa
Walkaway
Mingenew
Carnamah
Lake Moore
Yarra Yarra
Dongara
Denison
Irwin R.
Champion Bay
Marchagee
New Norcia
Gingin
Gulf Hope
PERTH
Fremantle
Rottnest I.
Robert Point
Peel Inlet
Cape Bouvard
Naturaliste Reef
Geographe Bay
C. Naturaliste
Quindalup
Cape Leeuwin
Flinders Bay
D'Entrecasteaux Point
Bunbury
Busselton
Augusta
Kelbarrow
Leeuwin
Denmark
Nuyts Point
Williams Bay
West Cape Howe
Yurt Bay
King George Sound
Murchison Goldfield
Nannine
Lake Way
Lake Nabberoo
Sir Samuel
Lawlers
Lake Austin
Lake Darlot
Lake Violet
Lake Annean
Lake Barlee
Lake Merrin
Monger
Coorbedar
Lake Bryde
Lake Cowan
Dundas Goldfield
Yilgarn Goldfield
Coolgardie Goldfield
Boorabbin
Southern Cross
Coolgardie
Kanowna
Kalgoorlie
Goldfields
L. Lefroy
Lake Lapage
Queen Victoria Spring
Lake Cowcowing
Pootalkine
Boorabbin
Southern Cross
Yilgarn
Coolgardie
Goldfield
York
Beverley
Pingelly
Narrogin
Williamsburg
Collie Fields
Broome Hill
Kojonup
Katanning
Cranbrook
Jerramungup
Esperance
Doubtful Isl. Bay
Cape Riche
Point Culver
Cape Arid
Eastern Group
Duke of Orleans Bay
Archipelago of the Recherche
Middle Group
Western Group
Esperance Bay
Twilight Cove
Scorpion Bay
Red Rock Point
Nuyts Archipelago
Eucla
Wallabie
Coymbra
Noonaera
Eyre
Hampton Tableland
Nullarbor Plain
Richards
Au
Lake Carey
Lake Sir Thomas Elder
Lake Baron Muller
Lake Amadeus
Salt Lakes
Grassland
Desert
Great Victoria
Great Sandy
Great Sandy Desert
Gibsons Desert
Great Australian Bight
Alfred and Marie Range
Rawlinson Range
Peterman Range
Sutherland Range
Lake Macdonald
Dry Lakes
Buzoes Grave
Mt. Heuglin
Hermannsburg
James
Musgrave
Nomans Lake
Salt Lakes
Western Australia
Longitude East from Greenwich
110°
120°
130°
10°
20°
30°

QUEENSLAND
NEW SOUTH WALES
VICTORIA
SOUTH AUSTRALIA
NEW GUINEA
CORAL SEA
GULF OF CARPENTARIA
GREAT BARRIER REEFS
CAPE YORK PENINSULA
Cape York
Endeavour Strait
Port Musgrave
Oxford Ness
Shelburne Bay
Cape Grenville
Temple Bay
Yewcastle Bay
Lloyd Bay
Cape Direction
Cape Sidmouth
Princess Charlotte Bay
Flinders Is.
Bathurst Bay
Cape Melville
Barrow Point
Howick Group
Lizard I.
Cape Flattery
Cape Bedford
Hope Valley
Cooktown
Laura
Maytown
Palmer
Goldfields
Arton
Cape Tribulation
Port Douglas
Trinity Bay
Cairns
Cape Grafton
Herberton
Geraldton
Double Point
Rockingham Bay
Hinchinbrook I.
Palm I.
Halifax Bay
Magnetic I.
Cape Cleveland
Bowling Green Bay
Upstart Bay
Townsville
Charters Towers
Millchester
Ravenswood
Gilberton
Percyville
Lyndhurst
Charlestown
Georgetown
Croydon
Normanton
Karumba
Chillagoe
Irvine Bank
Abington
Coolgarra
Mareeba
Kuranda
Cairns
Port Douglas
Cape Tribulation
Arton
Trinity Bay
Holmes Reefs
Diana Bank
Willis Islets
Flinders Reefs
Lihou Reef
Tregrosse Islets and Reefs
Osprey Reef
Coen
Archer R.
Coen R.
Edward R.
Wenlock R.
Ducie R.
Watson R.
Jardine R.
Morehead R.
Mitchell R.
Palmer R.
Walsh R.
Barron R.
Hann R.
Mulgrave R.
Russell R.
Johnstone R.
Daintree R.
Normanby R.
Annan R.
Endeavour R.
Bloomfield R.
Lockhart R.
Stewart R.
Pascoe R.
Jeannie R.
Olive R.
Laura
Maytown
Palmerville
Lakeville
Stanton
Gambold

AUSTRALIAN TYPES

1 North Australian 2 North Australian Woman 3 South Australian Woman 4 South Australian, Moroya Tribe 5 Tasmanian Woman 6 Aboriginal of New Guinea 7 Fiji Chief 8 Fiji Girl 9 Assachoreter of Taling 10 Tonga Girl of New Caledonia 11 Man of Utuan 12 Man of New Britain

expedition under Capt. James Cook, who had taken soundings for General Wolfe in the St. Lawrence during the siege of Quebec. This expedition was under the auspices of the English Royal Society, and was equipped for the purpose of taking observations on the transit (June, 1769) of Venus over the solar disc. Australia had its beginnings as a British settlement in 1788, when its coasts were utilized as places of banishment for criminals, Botany Bay being the first penal colony, in what became the colony of New South Wales. The Moreton Bay district in Queensland was settled in 1825, but the colony was not organized until 1859. Port Philip district, settled in 1835, was erected into the colony of Victoria in 1851. The colony of Western Australia was founded in 1829, and South Australia in 1836. The population, which had been slowly increasing, was rapidly augmented by the influx of immigrants on the discovery of gold in 1851, and the country entered on a career of continued prosperity.

*The Commonwealth.* In 1901 the colonies of Australia, including Tasmania, were federated under the crown, somewhat after the fashion of the Dominion of Canada. These comprise New South Wales, which may be said to be the mother colony (area, 310,367 square miles; population 1911, 1,648,448); Victoria, (area 87,884 square miles; population, 1,303,387); Queensland (area, 670,500 square miles; population, 605,813); South Australia (area, 380,070 square miles; population, 408,808); Western Australia (area, 975,920 square miles; population, 282,114); and Tasmania (area, 26,215 square miles; population, 191,211).

The constitution bill was in June, 1898, submitted by means of the referendum to the people and passed upon; while in January, 1899, at a conference of premiers held in Melbourne, an agreement was come to on all matters in dispute, the British parliament ratifying the federation measure. The federation of Australia was inaugurated at Sydney, New South Wales, by representatives of the Crown, with Lord Hopetown as the first governor-general, in the summer of 1901. Legislative power is vested in a federal parliament, consisting of the king, a senate and a house of representatives, the king being represented by a governor-general. The constitution provides for a common tariff, for interstate free trade and for a common control over matters of national defense. Each of the colonies retains its own parliament to deal with purely internal affairs. Education in the new commonwealth is compulsory, and under state control and free; while there is no state church. The credit of effecting Australian federation is shared by the Rt. Hon. Geo. H. Reid, P. C., premier of New South Wales, and Sir John Forrest, first premier of Western Australia and president of the federal council of Australasia. New Zealand did not enter the commonwealth, though provision is made for so doing later on, should it desire to become federated with the six colonies of the neighboring continent. Future amendments to the federal constitution are provided for by means of a majority vote of both houses of the Australian parliament, followed by a referendum to the whole people.

New South Wales. It was only by slow degrees that New South Wales emerged from the status of a convict colony. A good deal of the first rough labor was, however, done by exported criminals, in constructing public buildings, in making roads and in clearing the land. Early in the 19th century some fine breed of sheep was brought to the settlement, and as the pasturage was excellent and the climate favorable, the sheep did well and greatly multiplied. Assisted immigration in time brought numbers, and in 1841 the reception of convicts ceased. In the early fifties a great impulse was given to the colony by the inrush of miners and adventurers owing to the discovery of gold. In 1843 representative government was introduced, and twelve years later responsible rule was fully established, with a parliament consisting of two houses. Finally, education came under state control, and the University of Sydney was founded as the apex of the system. Technical education is also fostered and subsidized by the government. Sydney, the capital, has a population, including suburbs, of 605,900. The other chief towns are Newcastle, Bathurst, Goulburn and Parramatta. One third of the people are engaged in agricultural, pastoral and mineral pursuits. Over 40,000 are engaged in the mining of gold, silver, coal, etc. The value of the annual product of gold is nine million dollars. An equal value of silver-lead ore and metal is annually mined. Other exports include coal, hides and skins, leather, wool and meat preserved and frozen. New South Wales is the premier wool-producing colony, taken from the immense numbers of sheep pasturing on the western plains. Only one per cent., as yet, of the land is under cultivation, while twenty-five per cent. is under forest or brush.

Victoria, next to New South Wales, is the most densely populated colony in the new commonwealth. The capital is Melbourne, with a population of 591,830, or nearly two-fifths of that of the entire colony. The other chief towns are Ballarat (44,000), Bendigo or Sandhurst, as it is now called (42,000), and Geelong (28,880). In 1898 the exports of gold (inclusive of specie) amounted to nearly

thirty million dollars; the other principal exports were of wool, cereals and flour, hides, skins and furs, leather and harness, butter and live stock. Half of the cultivated area is under wheat, the other crops being oats, barley, hay and potatoes. Since 1851 it is estimated that gold to the amount of 1,365 million dollars has been extracted from the mines. The educational institutions include, besides the state primary and technical schools, the University of Melbourne, with three affiliated colleges, The latter has both an examining and a teaching body, and by royal charter, granted in 1839, is empowered to grant degrees in all faculties save divinity.

QUEENSLAND comprises the whole northeastern area of the continent, with its adjacent islands in the Pacific and in the Gulf of Carpentaria. The northern portion of the colony was, prior to 1850, known as the Moreton Bay District. From its great area and climate, its products are many and diversified, including not only the staple cereals and grains, vegetables, etc., but sugar cane, oranges, pineapples, bananas, arrow-root, tobacco, coffee and cotton. The woods afford large supplies of fine timber, and bees are raised largely, as nearly all the forest trees flower and provide large supplies of honey and pollen; while the winters are so mild that the bees are not compelled to remain in the hives and consume their own stores, as in colder countries. Within the colony, it is estimated, there are 5,000 square miles of coal-yielding country, though scarcity of labor, it is said, hinders its mining development. Primary secular education is provided free by the state. There are also schools of art, where technical instruction is given. Brisbane, the capital, with two municipalities (Brisbane and South Brisbane), has a combined population (1907), of 130,000. The gold product for the year 1905, amounted to 592,620 ounces; other minerals mined include silver, copper and tin.

SOUTH AUSTRALIA extends across the center of the continent from north to south, having Western Australia on the west and the other colonies (Queensland, New South Wales and Victoria) on the east. The capital is Adelaide, on the river Torrens, which has a university; its population is 184,393. It is the great emporium of the colony for its large exports of wool, wheat, hay, live stock and its minerals, silver and copper ore. In the northern territory of the colony large numbers of horses, cattle and sheep are raised. In 1911 it had 1,935 miles of railway open for traffic and nearly 6,000 miles of telegraph in operation, including the overland line running between Adelaide and Port Darwin (a distance of 2,000 miles) in connection with the British Australian cable.

WESTERN AUSTRALIA is the largest of the commonwealth colonies, though it is the most sparsely settled, except in the southwest corner around Perth, the capital (population 54,354). The other chief town is Fremantle (19,346), named after Captain Fremantle, who after the first settlement of the colony, in 1829, claimed posession of it in the name of George IV. The colony was then known as the Swan River settlement. In 1850 it became for a time a penal settlement of Britain; but in 1868 transportation of the criminal class was abolished. The chief difficulty in the interior is said to be want of water. The inland mining region around Coolgardie and Kalgoorlie is one of great industrial activity, especially since the railway has been constructed to these mining centers and on as far as Menzies. The chief exports are gold (the value of which, shipped, in 1904 amounted to $19,000,000), pearls and pearl-shell; sandalwood, timber, wool and skins. Along the river courses of the north and northeast are, it is estimated, about 20,000,000 acres of fairly well-watered country, affording good pasturage. Australian defense is maintained by subsidies granted by the separate colonies, including Tasmania and New Zealand. At Sydney, N. S. W., there is a first-class naval station, the headquarters of the British fleet in Australasia. The principal ports of the colonies are protected by fortifications, maintained at the expense of each colony.

**Australian Ballot System** is the system of voting used by the several colonies of Australia. It was invented to secure absolute secrecy to the voter and so prevent bribery at elections and effectively check fraud in voting. The printing of the tickets and all expenses are borne by the government. There is but one ticket, on which are printed the names of all the candidates. No electioneering is allowed within fifty feet of the polls. Separate compartments or voting-booths are provided, into which one voter at a time goes, and prepares his vote by drawing a line through the names of the candidates he does not wish to vote for. The system was adopted in New South Wales in 1858, and speedily came into use in the other Australian colonies, where it proved highly successful. The present law in regard to voting in Great Britain, based on this system, was passed in 1872. The Australian method, with some changes, has been adopted in Massachusetts, New York, Illinois, Connecticut and other states, where it has been heartily approved.

**Aus'tria-Hun'gary,** the second largest country in Europe, lies between Germany, Russia, Rumania, Servia, Turkey, the Adriatic, Italy and Switzerland. It is a loose union of two independent states; extends 800 miles east and west, 650 from

AUSTRALIAN ANIMALS

BY PERMISSION F. E. COMPTON & CO

1—Kangaroo. 2—Tree Kangaroo. 3—Marsupial Wolf. 4—Duckbill. 5—Ant Porcupine. 6—Nymph. 7—Nestor Parrot. 8—Owl Parrot.
9—Bird of Paradise. 10—Emu. 11—Cassowary. 12—Kiwi. 13—Lyre Bird. 14—Talegalla Hen. 15—Bridge Lizard.
16—Ceralodos. 17—Helmeted Cockatoo.

north to south; has an area (including Bosnia and Herzegovina) of 259,679 square miles, less than that of Texas, and a population of nearly 50,000,000; and is the only large European state without possessions outside of Europe. The name Austria means the east country, because Austria originated in 796 as a county east of Germany; and Hungary means Hunland, because the Huns lived there four centuries before the Magyars came.

*Surface and Drainage.* Austria, next to Switzerland, is one of the most mountainous countries in Europe, the Tyrolese scenery being grand and beautiful. The mountains are the Alps in the west, whose loftiest heights tower nearly 13,000 feet, and the Carpathians on the north and east that rise almost 9,000 feet. There also are moderate heights in the south. Between these ranges lie the lowlands of Austria and the plain called Hungary. The chief rivers are the Danube, Dniester, Moldau-Elbe and Vistula. The first two drain to the Black Sea, the third to the German Ocean, the fourth to the Baltic. Small mountain lakes are numerous and beautiful, large lakes few.

*Climate and Rainfall.* The climate and rainfall vary greatly, and we find northern, intermediate and southern zones. In Bohemia, Galicia, Moravia, in the northern districts of Austria proper and Hungary and in Silesia the winters are long and severe, the summers warm but brief. In Carniola, Styria and middle Hungary the summers are hot, the winters moderate. In Bosnia and Croatia, in semitropic Dalmatia and southern Hungary the winters are brief and mild, the summers long and hot. The annual mean temperature is 50°, the range of rainfall from 25 inches on the Hungarian lowland to 100 on the Carpathians.

*Resources.* Austria-Hungary is almost the richest of European countries in minerals, all except platinum being found. Copper, coal, iron, lead, petroleum, quicksilver and rock salt abound. The Indria quicksilver mine ranks next to that of Almaden, Spain. Bleiburg lead-mines are the richest in Europe. The Galician salt-mines are a world's wonder, the deposits being 1,200 feet deep and 300 miles long. Thirty miles of galleries have been dug, and villages built far below the surface. The gold-production is the second largest in Europe, some of the gold mines having been worked by Celts and Romans. The mountains are covered with forests full of valuable varieties of timber Practically all the land is utilized, three fifths of Austria-Hungary's area being devoted to agriculture and one third to forests.

*Agriculture.* The staple industry is agriculture. More than two thirds of the Hungarians and Austrians till the soil or raise stock. The plants and grains of the temperate zones prevail and a great variety of agricultural products is raised successfully. Austria leads in barley, flax, hemp, hops, potatoes, rye, sugar beets and tobacco; Hungary, the granary of Europe, in cattle, maize, oats, the vine and wheat. Fruit-raising is a great industry. The pear and apple thrive in the north; grapes and prunes in Hungary; and almonds, figs, lemons, olives and oranges in the south, while along the Adriatic the palm flourishes in the open air. More horses are raised than in any other country of Europe except Russia. Hungary is famous also for fine mules, and poultry-raising is extensive.

*Manufactures and Commerce.* Austria-Hungary is a land of transition from the industrial west to the agricultural east; Austria being more the manufacturer, Hungary more the farmer. But Hungary invented modern processes of flour-making and Budapest leads Europe as a milling center. The best inventions are employed, wheat is classified in seven grades, and uniformity of product causes Hungarian flour to command high prices. Wine-making is another great Hungarian industry, Tokay being world famous. In Austrian lands textiles are the most important manufactures, then woolens, carpets, machinery, railroad materials and tools, leather and gloves; and furniture, ships and toys. Bohemia has half the glass-factories, and Bohemian glass has been famed for centuries. The manufacture of beet-sugar ranks next to Germany's production. The largest exports are sugar, timber, cattle, wheat, leather goods, eggs, coal and glass; the main imports are cotton and wool fibers, yarn, cloth and machinery. Germany is the greatest buyer and seller, America the third among buyers and sixth among sellers. We buy Austria-Hungary's glass, gloves, sugar, porcelain, pottery, musical instruments and beer, and sell cotton, corn, hog-products and pig-iron, buying a fourth as much as we sell.

*Transportation.* River valleys, mountain passes and a coast of only 465 miles form nature's roads to foreign countries. The Danube, whose course of 820 miles in Austria is fully navigable, is free to all nations and seagoing ships navigate it from the Black Sea into Germany. The stream is connected by canals with the Elbe and Theiss and has over 100 navigable tributaries. The Moldau-Elbe at favorable stages is navigable from above Prague, Bohemia, to Hamburg, Germany. The Morava and Oder open waterways from Vienna into German Silesia. The Save and Drave, important navigable tributaries of the Danube in the south, are also linked by a canal. The waterways available for steamers give 1,620 miles of inland

navigation, the others 2,340 more. The merchant marine is the smallest in Europe, most of the maritime traffic passing through Trieste and Fiume on the Adriatic. Since the rivers do not lead to these ports, four fifths of Austria-Hungary's ocean-freight are transported by railroads, all converging on Vienna and Budapest. The railroads are less developed than in most European countries, their mileage of 25,000 miles being only one-third that of France, but international overland routes lead to Bucharest, Constantinople and Salonika. A railroad through Arlberg tunnel leads to Geneva, Marseilles and Paris, another over Brenner pass into Germany and Italy, and a third via Semmering pass and tunnel to Genoa, Trieste and Venice.

*Education.* Primary instruction is compulsory and free from six to fourteen years of age. The schools are controlled by a department of public instruction, and are excellent, but every province remains responsible for the management of its schools. For secondary instruction admirable provision is made in hundreds of excellent colleges, gymnasia or high schools, professional and technical schools, and eight universities. Among these, Prague and Vienna are famous.

*History.* Austria was founded as a small outpost of the Empire of Charlemagne in 796. Arpad a century later founded Hungary (886), and for six and one half centuries each grew independently. Hungary became a Kingdom in 1,000, many of its present institutions originating then; Austria a duchy in 1156, the accession of the Hapsburgs in 1282 initiating its greatness. Hungary in 1222, like England in 1216, won a constitution, and till 1490 was the strongest state in central Europe. The Hapsburgs meanwhile acquired Carinthia, Carniola, Styria and Tyrol and the headship of the Holy Roman Empire, Vienna about 1500 becoming the metropolis of German art and science. In 1526 Hungary fell before Turkey but Austria obtained Bohemia, Hungary, Moravia and Silesia and received recognition as a European monarchy. At the Reformation, which made great progress in Hungary where millions today are Protestants, Austria remained with the Roman church. It was the bulwark of Christendom against Turkey, the mainstay of the papacy against Calvinism and Lutheranism. Its almost ceaseless wars succeeded in liberating Hungary from the Turkish yoke. Numerous German colonists brought German civilization to Hungarian towns. The Hungarian estates, assembling in Pressburg, staunchly resisted every effort to absorb Hungary in the Austrian Empire. The Austrian states were in 1804 united as the Empire of Austria, its archduke becoming "Hereditary Emperor" and in 1806 he ended the Holy Roman Empire. Austria was a powerful force in overthrowing Napoleon and from 1815 to 1865 opposed every attempt of the Magyars at independence. In 1848 Hungary rose under the lead of Kossuth, but was subjected to the imperial armies with the help of Russia. Austria renewed its efforts to germanize Hungary but failed and meanwhile lost Italy and Germany. So independence and selfgovernment were restored to Hungary and arrangements were made that united Austro-Hungary to a real union founded upon the same dynasty and an old pact called the Pragmatic Sanction dated 1721-1722. By this fundamental law all parts of the old Hapsburg Empire were forever united under the rule of its dynasty and bound to common defense against foreign attacks. Austria-Hungary have one army, coinage, diplomatic service, sovereign, and tariff, foreign affairs and war being managed by a dual committee called the Delegations; but Austria and Hungary each have their own ministry and premier.

**Austrian Hymn.** Known also as the Emperor's Hymn. Written by the poet Hauschka in 1796, and set to music for four voices by Joseph Haydn. It was first sung on the emperor's birth-day, February 12, 1797, at the national theater in Vienna and at the principal theaters in the provinces. Its combination of strength and simplicity well fit it for an adequate expression of patriotic sentiment. With Haydn it was a great favorite, which he often delighted to play, and which he introduced into the Kaiser quartet, No. 77, with elaborate variations. It endures as the best of Haydn's songs.

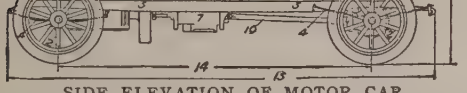
**Austrian Succession, War of the,** a war on the European continent which broke out in 1741 to defend the rights of Maria Theresa in her Austrian dominions, left to her, in what is called the "Pragmatic Sanction," by her father, Emperor Charles VI., who died without male issue. These dominions were claimed by some pretenders, notably by Charles Albert, elector of Bavaria (descending from Ferdinand I.), and by Augustus III., elector of Saxony (husband of the eldest daughter of the Emperor Joseph I.). In the struggle Britain allied herself with Austria, Russia, Hungary, and Poland, against France, Prussia, Spain, Sardinia, and Bavaria. The war continued from 1741 to 1748, when it was terminated by the Peace of Aix-la-Chapelle, Austria emerging from the conflict with the loss of Silesia, Parma, and Piacenza. The chief incidents of the war were the defeat of the French by the British at Dettingen, and the French victory of Fontenoy over the Duke of Cumberland (British), and the allied Austrians, Dutch, and Hanoverians (Prussia having, in 1742, withdrawn from the struggle at the close of what is known as the first Silesian war). Other phases of the war of the period between the English and the French are known as King George's war, and the at-

tempt of Prince Charles Edward Stuart, "the Young Pretender," to effect a landing in Scotland in 1745, and who, after winning the battle of Prestonpans, was routed at Culloden.

**Auto-da-fé** (*a'tō-dȧ-fā'*) or **Act of Faith,** a ceremony, often of a hideously fantastic and inhuman kind, by which the guilt or innocence of a heretical human victim was inquired into or set forth by the Spanish Inquisition. During these ceremonies and processions, a large concourse of people were generally gathered together, to witness what mostly happened, the handing over of the victim to the secular power to be put to death at the stake. Autos-da-fé were, in the 17th century, of frequent occurrence in Seville and Madrid, as well as in some cities of Portugal.

**Automobile** (*au'tō-mō'bēl*), a vehicle for street and road use, which carries its own motive power. Steam road vehicles have been used in England since 1865, but it was not until 1893 that the modern horseless vehicle, including pleasure carriages, passenger coaches and freight trucks, began to be successfully developed. Since 1900 the manufacture, sale and use of automobiles have developed and grown so swiftly as to be one of the amazing features of our century. In 1901, 26 motor cars were imported into the United States. At the close of 1911 there were in use in the United States 780,000 pleasure motor vehicles and 18,000 commercial vehicles. The total production of the industry in the United States in 1909 was 127,287 machines. The capital employed in the industry in the United States is approximately $90,000,000, and the estimated value of all motor vehicles in use is $370,000,000.

The popularity of the automobile is due to its possession of greater speed-capacity

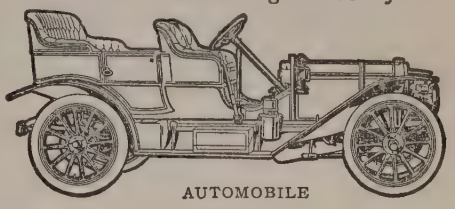


SIDE ELEVATION OF MOTOR CAR

1, Pneumatic tires. 2, Wheels. 3, Axles. 4, Springs. 5, Pressed steel frame. 6, Motor cylinders. 7, Gear change mechanism. 8, Body. 9, Steering mechanism. 10, Drive-shaft. 11, Brake lever. 12, Gear-change lever. 13, Height over all. 14, Wheel base. 15, Length over all.

than that of the swiftest horse and also to its ease of running and its freedom from jolting. Its gain in speed and durability within a few years is a remarkable instance of evolution in modern mechanism. The gasoline-engine has so far formed the most popular motor, but on heavy roads steam has greater flexibility and superior hill-climbing powers. Steam-propelled autos, however, demand more experience and carefulness on the operator's part. The electric motor, though not remarkable as a hill-climber, has the merits of convenience and cleanness. In a gasoline motor a storage battery supplies the spark for igniting the fuel. Electric autos are operated by storage batteries.

The records of automobiles for speed and endurance challenge comparison with those of the swiftest and strongest railway loco-



AUTOMOBILE

motives. In 1895 a motor-carriage ran 736 miles in 48 hours and 53 minutes, or 15 miles an hour, but now 60 miles an hour on the road is an ordinary record.

The touring auto goes everywhere—in the wilds of Africa, in the wastes of Asia and across America from ocean to ocean. The motor cycle is also very popular, particularly in America and England. For the motor cycle an air-cooled four-cycle, single-cylinder engine of three and one-half horsepower is most widely used. There is a trend toward employing the touring-car as a revival of the romantic coach of our ancestors, but more important is the auto's adaptation to swift passenger-service. Light motors may yet revolutionize municipal streetcar systems and suburban lines, and remove their tracks from highways.

But the automobile's preëminent service is to be that of dray-horse and freight-carrier. Autotrucks gain steadily in public favor. Great progress has been made by the manufacturers of this type of automobile, and many plants throughout the United States have been erected for their exclusive manufacture. Their efficiency in the matter of work and small cost of operation have been established, and many great corporations are substituting them for horse-drawn vehicles.

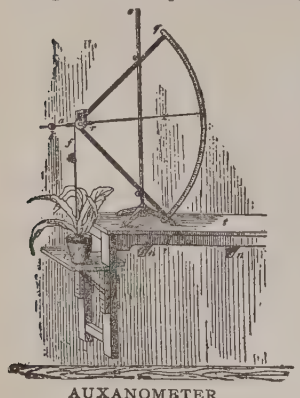
In addition to autodrays there are autobusses, electric cabs, auto-fire engines and road-locomotives or traction-engines. The last were used before autos, but are equally entitled to be styled automobiles, though it required the development of the latter to teach the makers of the former to build well. These traction-locomotives proved useful during the European War, traveling over poor roads at greater speed than infantry could march and drawing heavy loads. A fifteen-ton engine draws forty tons of wagons forty miles a day, and can make twelve miles an hour. There is scarcely a commercial calling where these traction engines fail to figure. The future

in heavy haulage, so soon as fit roads can be had, belongs to the automobile, and its influence has already initiated a new era in American roadmaking.

**Autumn Coloration** (in plants). This phenomenon is associated with the deciduous habit, and is displayed by shrubs and trees throughout the temperate regions. The vivid colors have attracted a great deal of attention, but as yet no adequate explanation has been offered. The two types of color which appear, the reds and the yellows, seem to be due to different causes. The yellow is a post-mortem change of the green, an example of which may be observed in a poorly blanched stalk of celery, where the transition from green to white is seen to be through yellow. The red color is a product of the living substance of the leaves, manufactured at a time when the work of the leaf is beginning to flag. It has been suggested that the red color is of incidental advantage to the plant in that it raises the temperature of the leaves slightly and in this way protects the living substance from chill while it is retreating into the permanent parts of the plant previous to the fall of the leaves.

**Auvergne** (*ō'vârn'y'*), a branch of the Cevennes Mountains. The mountains lie in confused groups, sending up several summits to the height of 6,000 feet. Not only do the cone and domelike shapes of the summits betray a volcanic formation, but the great masses of peculiar rock that break through the crust of granite and gneiss render it evident that this was a great focus of volcanic action at a comparatively recent period. Among the summits that have apparently been at one time volcanoes, the most remarkable are Cantal, Mont-Dore and Puy-de-Dôme. All are now covered with verdure. There are rich deposits of iron, lead and other ores in the region, which was once an ancient province and today is a department of France.

**Aux'anom'eter.** A device for measuring the growth of plants during short periods, when it is too slight readily to admit of direct measurement. In all forms the growth is magnified by causing the plant, acting on the short arm of a lever or the hub of a wheel, to displace an index five to twenty times more than the actual movement. (See figure.) In the more elaborate forms the index registers its movements on a smoked surface.



AUXANOMETER

**Av'alanche,** a mass of snow or ice which slides down the sides of high mountains, often causing great destruction. There are various kinds of avalanches. Drift or powder avalanches are loose, dry snow, which is set in motion by the wind and rushes into valleys in the form of great dust-clouds. They usually occur in winter and are very dangerous, because of their suddenness, often suffocating men and animals and overturning houses by the compression of the air which they cause. Another kind of avalanche is like a landslide. The melting of the snow in spring makes the soil slippery, and great masses of snow are carried down the mountains by their own weight, taking trees and stones with them. If they come to a precipice in their course, as they often do, they are hurled with tremendous force into the valley beneath, destroying whatever is in their path. Ice avalanches often occur in summer. They are masses of ice which detach themselves from the mountain glaciers, commonly in July, August and September. Nine great Alpine avalanches, which destroyed 447 lives, are recorded between the years 1578 and 1827.

**Avebury, Lord.** See LUBBOCK, SIR JOHN.

**Averell, William Woods,** American general and inventor, was born in Steuben County, New York state, November 5, 1832, and graduated from West Point in 1855. When the Civil War broke out, he was on duty in the west, fighting the Kiowa Indians. He then organized a corps of mounted riflemen, and in August, 1861, received the appointment of colonel, acting in most of the campaigns of the period with the Army of the Potomac and operating in cavalry raids. In 1865 he resigned, having the rank of major-general, and from 1866 to 1869 was United States consul-general in Canada, subsequently becoming interested in a large manufacturing company as president. While so occupied, he in 1869–70 discovered and perfected a process of obtaining cast steel direct from the ore; in 1879 he invented the American asphalt pavement; and subsequently he invented what is known as the Averell insulated conduit for electric wires and also a machine for laying electric conductors underground. He died in 1900.

**Aver'nus,** called now Lago d'Averno, is a small circular lake in Italy, It is about a mile and a half around, and lies in the crater of an extinct volcano. It is in some places 200 feet deep, and is almost completely shut in by steep and wooded heights. The sulphurous vapors arising from it were believed in ancient times to kill the birds that flew over it, and so it probably got its name from a Greek word meaning

"birdless." Its gloomy and awful appearance made it the center of almost all the stories of the ancients about the world of shades. Here was Homer's and Vergil's entrance into the lower world, and here were the Elysian fields, the cave of Hecate and the grotto of the Cumæan Sibyl. Agrippa connected it with the Lucrine Lake and the sea, making it a sort of harbor; but the volcanic upheaval of Monte Nuovo, in 1358, again made Avernus an inland lake. On its east side are the ruins of a temple of Apollo, and on its south side what is shown as the grotto of the Sibyl.

**Avignon** (*ā-vēn-yōN'*), a city in Provence, France, is on the left bank of the Rhone. Its streets are narrow and crooked, and it is still surrounded by high walls. Here is the cathedral of Notre Dame, dating back to the 11th century. There are so many churches and convents that Avignon has been called the city of bells. It has manufactures of paper, leather, silk, iron, etc., and is famous for its garden produce, fruit wine and honey. Here the great Italian poet, Petrarch, lived for some years, and here in a church that is still pointed out, he first saw Laura, the lady to whom he wrote his beautiful sonnets. In the middle ages Avignon belonged to the popes, and here Clement V and six of his successors lived. Here also lived the antipopes for forty years. Population, 51,000.

**A'von.** There are several rivers of this name in England, Scotland, Wales and France. The most noted is called Upper Avon, which gains its importance from passing Stratford, the birthplace of Shakespeare. It rises in Northamptonshire, and flows southwest till it joins the Severn at Tewkesbury. It is about 100 miles long.

**Ax'il** (in plants). The upper angle formed by a leaf and the stem axis on which it is inserted. It is in the axils that branches normally arise.

*a, a,* AXILS

**Aylesworth, Hon. Allen Bristol, K. C.,** educated at Toronto University. A distinguished lawyer. One of His Majesty's Commissioners in the Alaska Boundary case. Elected to the Canadian House of Commons in 1905, a prominent member of the Laurier government. Appointed Postmaster General in 1905, and Minister of Justice in 1906. One of the ablest and most influential members of the Laurier administration.

**Aylmer** (*āl'mĕr*), **Col. the Hon. Matthew,** Adjutant General of Militia (Canada). Eldest son of Lord Aylmer. Born in province of Quebec in 1842. Educated in Montreal and at Trinity College, Dublin. Entered the army as Ensign in Her Majesty's 7th Royal Fusiliers then quartered at Malta (1864). Retired from the Imperial Service in 1870. In 1896 he became Adjutant General of the Militia of the Dominion. Was second in command of all the colonial forces that took part in the Diamond Jubilee celebration in England. A thorough soldier and successful administrator.

**Azalea** (*a-zāl'ya*), a flowering plant belonging to the Heath family, closely related to the rhododendron. It covers mountain slopes, is a native of the countries bordering on the Black Sea, and abounds in North America. They are among the most ornamental and beautiful of flowering shrubs, and are well represented by native forms in our eastern mountain regions. In the flowering season they are often completely covered with showy flowers of various bright colors.

AZALEA

The pink azalea, often called the wild honeysuckle, is distributed from Maine to Illinois and south to the Gulf of Mexico. It is a shrub from two to six feet high, the flowers grow in clusters, bloom in April and May, giving rosy hue to swamp and moist wood. Closely related to this is the clammy azalea or white honeysuckle, a shrub from three to ten feet high, bearing fragrant white blossoms in early summer. It is seen as a rule in swamps along the coast, found from Maine to Florida and westward to Texas. Decking the mountains of Georgia is the smooth or tree azalea, with June flowers of rare fragrance and beauty. The azalea is highly prized as a garden flower in Europe. European horticulturists were quick to appreciate its beauty. It is the national flower of Flanders.

**Azari'ah,** the tenth king of Judah, also called Uzziah, who began to reign about 809 B. C. It is also the name of one of the prophet Daniel's three friends, whose name was changed to Abednego. It is a common name among the Jews. The period of azariah's reign is 792–740 B. C.

**Azores** (*a-zōrz'*), a group of Portuguese islands in the mid-Atlantic, 800 miles west of Portugal. Carthaginian coins have been found on the islands, showing that the hardy sailors of Carthage must have been there. Edrisi, an Arab geographer, knew them before 1200, and an Italian map of 1351 represents them unmistakably. The islands were taken possession of by the Portuguese in 1431–1453 There are many hawks here, and the name Azores is from a Portuguese word, meaning hawks Their area is 919 square miles. or considerably smaller than

Rhode Island. The total population is 260,000. The capital is Angra (population, 11,067). They are of volcanic origin, and are still liable to eruptions and earthquakes, having had twenty-one earthquake shocks since 1444. Oranges are the chief export.

**Azov** (*ä-zŏv'*), **Sea of,** is a large gulf in the Black Sea. It was first called the Mæotic Marsh, from the name of the people dwelling on its shores. The Turks called it Fish Sea. The water is almost fresh. The whole sea is shallow, and measures 235 by 110 miles. The largest river emptying into it is the Don. During the Crimean War, there were sent to this sea, in 1855, a number of war vessels having on board 16,500 French, English and Turks. With this hostile array, the allies bombarded the ports and cut off supplies intended for Sebastopol.

**Az'tecs,** the name of the people found in Mexico at the time of the Spanish invasion, 1519, though the name strictly belongs to only one of the seven tribes occupying the country at that time. Aztec tradition represents these people as starting from a place called Aztlan and wandering for about 150 years before reaching Chapultepec. Where Aztlan was, and what was the origin of the Aztec tribes, are still doubtful. Mexico had been previously occupied by a people called Toltecs, a superior race whose ruins still prove skill in the arts of civilized life. These Toltecs were almost destroyed by famine and pestilence in the 11th century, so that the Aztecs found only a few rude, savage races occupying the land. In 1325, they built the City of Mexico, called Tenochtitlan, named after their chief, Tenoch. It was built on a few small islands in Lake Chalco, and was approached only by long and narrow causeways. It was so strongly fortified as to resist even the conquering Spaniards. The Aztecs seem to have been a fierce, savage people, yet with many traces of civilization, some of it probably borrowed from the Toltecs who preceded them. Their chief was chosen by the nobles; the laws were severe, but the courts were open. The records are preserved in the picture-writing of Mexico; the women shared in all the occupations of the men, and were taught to read and write, sing and dance, and were even learned in astronomy and astrology. They believed in one god, but they had many lower gods, of whom the chief was the frightful Huitzilopochtli. His magnificent temples were drenched with the blood of human sacrifices; no less than 20,000 victims, of whom only the heart was used as an offering, were immolated yearly to supply his altars. The priests were a large and powerful class, who had charge of the education as well as the religion of the nation; 5,000 were attached to the great temple of Mexico alone. The last king of the Aztecs was Moctezuma, who was treacherously imprisoned by Cortés and killed by the Aztecs in their revolt against the Spaniards. See *Popular History of the Mexican People* and *Native Races of the Pacific States*, by Hubert H. Bancroft

# B

**B** (*bē*), the second letter, is a consonant, and is called a sonant labial, because made by the lips and representing a sound, as in *able, boy, cab.* After *m* in the same syllable or before *t*, it usually is silent, as in *bomb, debt, bdellium.* The form is Roman, from Greek **β**, which, perhaps, is of Phœnician origin. All letters of the English alphabet, except *J, U* and *W*, come from the Latin, which derived them through the Greek from the Phœnician.

**Baal** (*bā'ăl*), the principal god of the Phœnician and Canaanitish nations, among whom Ashtoreth was the principal goddess. He was the god of the sun, as ruling and giving life to nature, while Moloch represented the sun as a destroyer, and both these ideas were united later in the god Melkarth. The oldest form of his worship was on the tops of mountains; thus the Midianites and Amalekites worshiped him on Mount Peor; the Phœnicians on Carmel and the Canaanites on Hermon. Upright conical stones, either in the open air or in temples, were a mark of his presence, but there were no images of him. From the earliest foundations of Tyre he seems to have been the protecting god of that city. His worship spread among all the towns of Phœnicia, including their distant colonies, such as Malta, Carthage and Cadiz. The Greeks connected him with Hercules, calling him the Tyrian Hercules. The worship of Baal was very attractive to the Jews, and many years of punishment were necessary to banish it from Israel. The word Baal is often used in connection with some epithet; as Baal-Berith (the Covenant Lord), and Baal-Zebub or Beelzebub (the Fly-God), the idol of the Philistines at Ekron, where he had a temple. Such proper names as Jezebel and Hannibal are compounds of the word Baal.

**Babcock Test,** a method of determining the amount of butter-fat in milk, named after Prof. S. M. Babcock, of Wisconsin Agricultural Experiment Station, who invented it in 1890. It depends upon (1) the separation of light from heavy parts by centrifugal force and (2) the action of sulphuric acid on all the solids of the milk other than butter-fat. The machine consists of deep brass cups attached to an upright revolving shaft, so that they will swing out horizontally when the machine is rotated by hand or steam power. In the cups are placed Babcock milk bottles. These are vase shaped with long narrow necks, and hold about 2½ cubic inches. Almost equal parts of milk and acid are mixed in the bottles in a special way. The acid decomposes the other solids and frees the fat. Being warmed by the chemical action, the fat particles run together, and being so much lighter than the acid mixture, the fat rises into the neck, which is so graduated that the amount of fat can be read off in percent. The rapid rotation of 900 to 2,000 or more revolutions per minute separates practically all the fat. The Babcock test was the first practical method of testing milk for commercial use. It has made it possible for creameries to pay for milk on a basis of cream value and has made it possible for the dairyman to estimate accurately the performance of each of his cows and so tell the amount of cream produced by each. Milk from different cows may vary in amount of butter-fat from 2% to 8%. Some cows will test less than others, but may, by reason of a greater quantity of milk, produce the same amount of butter. Milk for retailing is usually required by law to test at least 3% of cream. Cream is sold in different grades, as 12%, 18%, etc. See CREAM SEPARATOR. Ref.: L. L. Van Slyke: *Modern Methods of Testing Milk and Milk Products.*

**Ba'bel, Tower of.** According to the story in Genesis xi, the descendants of Noah journeyed from the east till they came to the plain of Shinar (Chaldæa), the Hebrew form of the native name Sumir, and there began to build a tower of burned bricks and pitch, whose top should reach the sky. But God confounded the language of the builders so that they could not understand each other, and the tower was called Babel or Confusion. A similar story has been found among the Babylonians, and the Greek story of the giants who attempted to scale the sky but were overthrown by Zeus has some likeness to it. The site of the tower was somewhere in Babylonia. It is usually supposed to be represented by the great pile of Birs Nimrud, which stood eight miles from the city of Babylon, was dedicated to Nebo, and was called the Temple of the Seven Lights. It had stood unfinished, till Nebuchadnezzar undertook to finish it, and its ruins still rise 153 feet above the plain. Another possible site is the ruin called Amram, within the city

itself. This mound is 1,100 yards long and 800 yards broad.

**Baboon** (*băb-oon'*), a family of monkeys, native to Africa and found also in parts of Asia. They have dog-shaped heads, long muzzles, large cheek-pouches in which a great quantity of food can be temporarily stowed away, frequently large and brightly-colored calloused cushions on their hips. In the adult males the canine teeth are developed into formidable tusks. They are quadrupeds, running swiftly on all-fours, climbing with great vigor, fond of sitting on their haunch pads and especially at home in mountainous districts. They often live in herds, and, led by patriarchs and guarded

BABOON

by sentinels, fight other herds or defend themselves against other wild beasts. Often when fighting they will stand erect. They are playful and amiable when young. It is said the ancient Egyptians trained them to pick fruit. When older, especially when kept confined, they are very savage. Their food is largely made up of fruits, roots, seeds, insects, worms, etc. Their raids on plantations are much dreaded. About a dozen different kinds are known. The largest and fiercest is called the mandril or ribbed-nose baboon, and is a native of the Guinea coast. This form has a rudimentary tail, while the common baboon has a well developed tail, twenty inches long in the adult. The baboon is thought to have been an object of worship in Egypt, inspiring reverence because of his wise-looking face.

**Bab'ylon,** capital of the empire of Babylonia on the Euphrates River, was said by the ignorant Greeks to have been founded by Queen Semiramis, who, it is related, employed two million workmen in building it. In Nebuchadnezzar's time, it stood on both sides of the river, in the form of a square. It was surrounded by walls, some 60 miles long, with 100 brazen gates. Here was a famous temple of Baal, by some thought to be built over the ruins of the tower of Babel; also the hanging gardens of Semiramis, one of the wonders of the old world. The Persians ruined Babylon by their conquest, Xerxes in particular, ravaging the temple of Baal. Alexander the Great undertook to rebuild the city; but when his ten thousand workmen, after two months' labor, had not even cleared away the rubbish, he gave up the project. After that it rapidly fell into ruin, and its materials were used in building the new city, Seleucia, by Alexander's successor, Seleucus.

**Babylo'nia** was the name given to the low plain watered by the lower streams of the Tigris and Euphrates. The country has always been one of the most fertile spots in western Asia. Herodotus tells us that it supplied one third of the corn of the whole Persian empire. This fertility was increased by a network of canals irrigating the whole country.

It has always been a land of many races and tongues, and almost every country is represented in the mixed gathering of nations living on its plains. Chronicles and lists of kings have been found that afford us considerable knowledge of the Babylonians. Boys became free citizens at the age of fourteen; women were well-treated; they could trade and own slaves, and offenses against the mother were severely punished. Slaves must not be treated cruelly, and all free Chaldæans must be educated and learn tablet-writing. Judges sat in the gates of the temple, and taxes were fixed by law. They were also no mean sculptors, and had learned the art of casting metals.

Babylonia's history in age rivals that of Egypt, going back at least 4,000 years before Christ. The first king who appears to have united the different towns into one kingdom was Urbaku (about 2,700 B. C.). In 2120 B. C., came in the Kassite dynasty, and then Babylon came to be known as the capital of the empire. From 1150 B. C. there were many wars between Babylonia and Assyria. Even the great kings suffered invasions from the north, as Nabonassar, who reigned fourteen years, beginning in 747 B. C., and whose kingdom was twice invaded by the Assyrian army. Tiglath-Pileser III, the Assyrian, completely overran the country, and ascended its throne as King Pul, being known by a different name in each of his kingdoms. This conquest brought Babylon and Nineveh, the two capitals, into close relations. Merodach-Baladan II succeeded, in 722 B C., in freeing the country from its northern neighbor, and by skillfully sending an embassy to Hezekiah of Judæa and other Syrian princes led them to revolt, and so kept the Assyrian Sargon too busy to march into Babylonia; but in 710 B. C. it was again conquered. When Assyria fell, Babylonia

rose on its ruins as a conquering empire. Nebuchadrezzar, its greatest king, reigned forty-three years (604–561 B. C.), reconquered provinces, rebuilt temples and palaces, and made Babylon once more queen of nations. Among other conquests he captured Jerusalem, carrying its king, Jehoiachim, captive to Babylon, and eleven years later destroyed the Jews' capital and removed most of the people to Chaldæa. The last notable king was a usurper, Nabunaid, who drove out Nebuchadrezzar's grandson, and who left almost as many inscriptions on bricks, cylinders or tablets as the great Nebuchadrezzar himself. The whole land revolted against him because he neglected the duties of government and religion, leaving everything to his son, Belshazzar. This made the country an easy prey for the Persian conqueror Cyrus, who captured Babylon in 538 B. C. It was afterward ruled by Alexander, by the Syrians, Parthians, Romans, the caliphs of Baghdad and several dynasties of the Persians and the Turks.

**Bacchus** (*băk'kŭs*), one of the names among the Greeks, and the usual name among the Romans, for Dionysus, the god of wine. In Italy, he was connected with the god Liber. He was the son of Jupiter, and was brought up by the nymphs at Nysa in India. Many stories are told of his adventures. He flayed Damascus alive, who opposed him in Syria; made Lycurgus, king of the Edones, mad, so that he killed his own son, and when he became sane, caused him to be torn in pieces by horses; he also overcame the Amazons. Bacchus taught men to cultivate the vine and to make wine. He collected bands of worshipers, mainly women, and, surrounded by them, seated in a chariot drawn by panthers or leopards, passed through many countries. He was represented in some works of art as an infant, but generally by the Greeks as a beautiful boy, while in the east he was pictured as a man of middle age, clothed in long robes. Festivals in his honor were first held in Thrace, but the most famous were at Athens and were four in number; the country festival in December, when the vintage was just over; the wine-press festival in January, when the wine was just made and the presses cleaned; the flower festival in February, lasting three days; and the great festival in March, when the city was filled with strangers from all Greece. In these festivals, banquets, processions and plays composed the program, and they were scenes of riotous merriment and drunkenness. In Rome the Bacchanalia, as it was called, was celebrated every third year; but it became so immoral and dangerous that the consuls in 186 B. C. forbade its observance. After this, the Liberalia were celebrated yearly on the 16th of March, on which day the young men began to wear the *toga virilis*, the badge of manhood.

**Bach** (*băk*), **Johann Sebastian,** one of the greatest musicians of the world, was born at Eisenach, Germany, in March, 1685. He belonged to a distinguished musical family, and at Erfurt, where a branch of the family lived for many years, the town musicians were called Bachs, even when no member of the family was connected with them. Losing his father before he was ten years old, his older brother undertook his musical education, but found it hard to keep his genius in check. He tried to hide from him a manuscript volume of organ pieces, but Sebastian managed to get hold of it and worked for six months copying it by the light of the moon, for fear of being found out; but was discovered and his copy taken from him. At fifteen he entered the choir of St. Michael's school at Luneburg. Here he remained as a violinist after losing his beautiful voice. In 1703 he was given a court appointment at Weimar, and in 1704 became organist at Arnstadt, where he composed many of his church cantatas. During the nine years spent as court organist at Weimar, he studied Italian music and did some composing. Some years followed at the court of Prince Leopold, where he wrote the first half of the collection known as *Forty-eight Preludes and Fugues*. His next appointment was at Leipsic, where all his greatest works for chorus were written. In 1747 he paid a visit to Frederick the Great at Potsdam, who received him with great honor. On a theme proposed by the king, Bach composed his *Musical Offering*, which, with his *Art of Fugue*, is a work of wonderful ingenuity and learning. An operation on his eyes resulted in total blindness. He died July 28, 1750. Piano-players owe to Bach the method of tuning, by which they can play in all keys, and also the mode of fingering which brings all the fingers into use.

**Bache** (*bāch*), **Alexander Dallas,** a noted American scientist. He was a great-grandson of Benjamin Franklin, and was born at Philadelphia in 1806. He graduated with high honors at West Point, where he was made an instructor. He was professor of natural philosophy and chemistry in the University of Pennsylvania, at Philadelphia, and later president of Girard College at the same place. He organized a system of free schools in Philadelphia. He was superintendent of the United States coast survey and regent of the Smithsonian institution. He was prominent in scientific circles, and was connected with many scientific societies in both hemispheres. He died at Newport, Rhode Island, February 17, 1867.

**Bacil'lus** (*bă-sĭl'lŭs*), a genus of the plants known as *Bacteria*, and distinguished from the other forms by consisting of rather elongated rod-shaped cells. See BACTERIA.

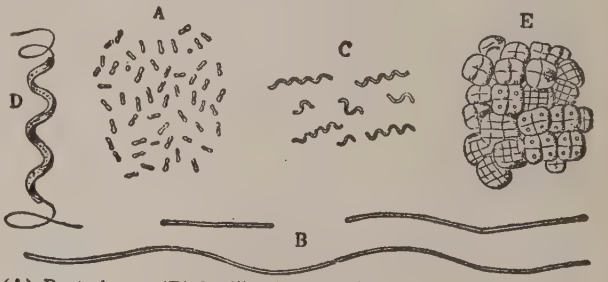
**Ba'con, Francis,** one of the most extraordinary men that any age can boast. A scholar, a wit, a lawyer, a statesman a philosopher, his writings will endure as long as the language in which they are written. He was born in London, January 22, 1561. He was sent to the University of Cambridge at the age of twelve. Before he was sixteen he wrote a paper against the philosophy of Aristotle, and at nineteen a work called *On the State of Europe*, the result of his studies while a member of the suite of the English ambassador at Paris. He was knighted in 1603, appointed consul to the crown, and in 1613 attorney-general. In 1617 he was made keeper of the great seal, and in 1618 appointed lord chancellor, with the title of Lord Verulam, and soon after was created Viscount St. Albans. His fall was as sudden as his rise was rapid. He was accused of bribery and convicted on his own confession. He was fined $200,000, and imprisoned in the Tower. Though the fine was remitted and the imprisonment lasted but two days, shame, added to failing health, kept him from appearing again at court. His death, April 9, 1626, was caused by a cold taken while making an experiment to test the power of snow to preserve flesh. Bacon's writings are numerous, but he is known best by his philosophical works, *Advancement of Learning* and *Novum Organum*, which introduced a new method into philosophy. "He rang the bell which called the other wits together," is his own description of the effect of these writings. The most popular of his works is his *Essays*, fifty-eight in number, on such subjects as *Pride*, *Truth*, *Ambition*, *Riches*, and they well repay study both of their contents and style.

**Ba'con, Leonard,** was the son of a missionary to the Indians, and was born at Detroit, Mich., in 1802. After graduating at Yale College and Andover Theological Seminary, he was a Congregational pastor at New Haven for many years. In 1866 he became professor of theology at Yale Divinity School and, later, lecturer on church history. He was a prominent contributor to the *Christian Spectator* and the *New Englander*, and was for several years one of the editors of the *New York Independent*. He also published a number of works. He died at New Haven, Conn., December 24, 1881.

**Bacon, Nathaniel,** a colonial leader, of English birth, the chief figure in Bacon's Rebellion, in Virginia, under the governorship of Sir Wm. Berkeley. He was born in Suffolk, England, January 2, 1647, and died (nominally a rebel) after the burning of Jamestown, Va., in October, 1676. He was educated at the London Inns of Court as a lawyer, and emigrating to Virginia, settled on the upper James River, and became a member of the governor's council. The colonists of the region were then harassed by the Indians, and being dissatisfied with Governor Berkeley's measures for the defense of the colony, they chose Bacon as their leader in the Indian war. Berkeley, however, proclaimed the expedition a treasonable one, and captured and tried Bacon; but he was acquitted by the council and reinstated as a member of the body. Bacon meanwhile opposed the governor's authority in other ways, and especially his arbitrary and unjust taxation of the colonists, his inefficient Indian policy; and his measures of restricted suffrage. The Indians again invading the colony, Bacon once more set out to subdue them. This he did, but had also to fight the governor and his forces, who once more had proclaimed Bacon a rebel. In the struggle, Jamestown, the capital of the colony, was taken by Bacon and burned, the governor's forces being routed, while Berkeley himself had to take refuge on an English ship in the river. At this juncture Bacon, however, died, and the war (styled Bacon's Rebellion) came to an end. Its influence on the subsequent American Revolution is capable of being traced.

**Ba'con, Roger** (1214–94), was an English monk and scientist. He studied at Oxford and Paris, became a Franciscan monk about 1250, and devoted himself to science. He made discoveries that ignorant people considered magic. So he was imprisoned twenty years, with one brief space of freedom. He wrote a Latin book, called *Opus Majus*, giving a comprehensive view of the progress of human knowledge. He invented or improved the telescope. As a scientific discoverer he was centuries ahead of his age.

**Bacte'ria,** an immense group of extremely small plants which have attracted great attention on account of their relation to man and his interests. They are the smallest known of living organisms whose adult bodies are sometimes barely visible under the highest powers of the microscope




(A) Bacterium. (B) bacillus (above), leptothrix (below). (C,D) spirillum (E) sarcina.

They multiply by division with wonderful rapidity, and occur in the air, in the water, in the soil, in the bodies of plants and animals. Some of them are harmless, some are useful, and some are exceedingly dangerous. They are the agents of the processes known as fermentation and decay, inducing fruit juices, milk, etc. to sour, and also pus to form in connection with wounds and decay. What is called antiseptic surgery is the use of various means to exclude bacteria and so prevent inflammation and decay. As producers of disease, bacteria are known by various names, such as bacilli, microbes, germs, etc. They are the causes of contagious diseases, such as pear-blight and melon-wilt among plants, and such human diseases as tuberculosis, cholera, diphtheria, typhoid fever, etc. From the fact that bacteria are mostly ciliated and have powers of locomotion, they are associated in the popular mind with animals.

**Baden** (*bä'den*), **The Grand Duchy of,** lies in the southwestern corner of the German empire, separated from Switzerland by the Rhine. It is divided into a plain and highlands, and of the latter the Black Forest is the most important part. It is drained by the Rhine and Danube, and so pours its waters into two opposite seas. The country is fertile, especially the Rhine valley, and rich in minerals. It is famous for its mineral springs. Among its manufactures the wooden clocks and straw plaitings of the Black Forest are known over the world; of clocks alone over seventy thousand are made yearly. The manufactures of jewelry at Pforzheim are the most important in Germany. Baden has a good school system, a Protestant university at Heidelberg and a Catholic university at Freiburg. The population is 2,010,728, of which a large majority are Catholics. A parliament of two houses limits the power of the sovereign, whose home is at Karlsruhe.

The earliest people of Baden were the Alemanni, and the present house of Baden began in the 11th century. At the time of the French Revolution, the spirit of change which was abroad in all Germany passed into Baden. The Grand Duke Leopold was driven out, but was restored to his throne by the aid of the Prussians. In 1867 though Baden had sided with Austria against Prussia, it was forced to enter the North German Confederation. The troops of Baden fought with distinction in the Franco-Prussian War, and the Grand Duchy became a part of the restored German empire. The present grand duke is Frederick I, who came to the throne in 1852. The area of the duchy is 5,823 square miles; Karlsruhe (population, 111,249) is the capital; but Mannheim (population, 163,693) is the chief town.

**Baden-Baden,** a town in the duchy of Baden, famous as a summer resort. It lies on the edge of the Black Forest. Though its actual population is only about 16,200, its summer visitors average over 50,000, and many strangers remain through the winter. Its hot springs, which attract many strangers, were known in the time of the Romans, Baden-Baden claiming to have been founded by Hadrian in the 2d century. In laying the foundations of the summer home of the grand duke, the remains of a vapor bath and a dungeon of that period were found. There are thirteen hot springs, with a temperature of 115° to 150°. The chief spring discharges in twenty-four hours about 4,200 cubic feet of water. The water of these springs is useful in skin diseases, gout and rheumatism. The attraction of Baden-Baden used to be its gaming tables, once the most famous in Europe, but now closed, which, besides paying a rent of $70,000, devoted as large a sum to adorning the promenades and public gardens. The scenery is beautiful. The picturesque ruins of the old castle still crown the summit of the Schlossberg, from which is had a fine view of the Rhine valley.

**Baden-Powell** (*bä'den-pō'ĕl*), **Robert Stephenson Smyth,** British general and one of the dashing and popular figures in the Boer war (1899–1901), is the son of the late Rev. Baden-Powell of Oxford, and was born February 22, 1857 and educated at Charterhouse, London. In 1876 he joined the 13th English Hussars, and served as adjutant of that regiment in India, Afghanistan and South Africa. In 1887–89 he served in South Africa as assistant military secretary on the staff took part in the operations in Zululand, for which he was mentioned in dispatches; was employed for a time in Malta; and in the command of the native levies in the war in Ashanti (for which he received a star and was raised to the rank of lieutenant-colonel). In the Matabele War, he was chief staff officer in that campaign. In the Boer War, he was given command of the 5th Dragoon Guards, and with a force of 1,200 men was besieged in Mafeking, on the Bechuanaland frontier, from October, 1899 till the town was relieved (May 18, 1900), the general displaying great tact and coolness in the conduct of the defense. He afterward took part in the advance on Pretoria, and was given command of the South African police for the pacification of the country. He is now British Inspector-General of Cavalry, and is the author of a work on *Reconnoissance and Scouting, Vidette Duty, Cavalry instruction, The Downfall of Prempeh, The Matabele Campaign* and on *Pig-Sticking or Hog-Hunting.* He is a noted sportsman, actor and athlete.

**Badger** (*bǎj'er*), a burrowing animal common in Europe, Asia and America. It is notable for the flatness of its short, clumsy body. Its head is pointed at the snout,

its feet armed with long claws, used for digging and also for defense. All badgers have heavy fur marked very distinctly. They are creatures of great strength and courage and wonderful acuteness. Left alone, they are timid and gentle. They live in burrows dug by themselves, are very shy about being

BADGER

seen, usually come forth only at night. The fur is valuable, the hairs used in making artists' brushes. The European badger, unlike the American, is fond of deep woods. Badger-baiting, a low sport once practiced in England, had to do with the arraying of one badger's strength against that of a number of dogs; from this comes the word "badgering," meaning persistent annoying. In Scotland the badger is sometimes domesticated. The American badger belongs to the west, and shows a fondness for open prairie. He is about two feet long, his color greyish with irregular black bands on the back, underneath whitish, throat and sides of the face white, in front of each eye a black patch, legs and feet black. The markings of the face remind one of a clown. With his strong claws he lays open the burrows of prairie dogs, ground squirrels, gophers, field-mice, etc.; feeds on these and on birds, frogs, small snakes, lizards, grasshoppers and other insects. He very seldom shows himself; if ever caught a distance from home will flatten himself "almost like a doormat or a turtle. His long, silky, grey hairs, parted in the middle down along his spine, spread out into the grass on each side, so that he seems to be only a slight hummock in the prairie." (*American Animals:* Stone and Cram).

**Baer, Karl Ernst von** (*fŏn bâr*) (1792–1876), a distinguished Russian naturalist, the founder of modern embryology. He was educated in Germany and became a professor in the University at Königsberg, where, in 1828, he published *The Development of Animals* (Entwickelungsgeschichte der Tiere), a set of careful observations and philosophical reflections that are most remarkable for clearness and thoroughness. This book made an epoch in the science of the development of animal life.

**Baffin's Bay,** a gulf on the northeast coast of North America, lying between Greenland and the great islands northeast of Hudson Bay. It is open to the Atlantic Ocean by Davis Strait, and to the Arctic Ocean by Smith Sound and Lancaster Sound. It is about 800 miles long, and on an average 200 miles in width. The shores are for the most part lofty and steep, and backed by snow-clad mountains. Baffin's Bay was discovered in 1562, but was named from William Baffin, who as pilot of an expedition in 1615 first explored it. It is navigable for only about four months in the summer, on account of the ice. Whaling and seafishing are carried on in its waters.

**Bag'dad,** the capital of the province of the same name in the southeast of Asiatic Turkey. It lies on both sides of the Tigris, which is spanned by a bridge of boats 220 yards long. The city is surrounded by a brick wall five miles around and forty feet high, with four gates. The place looks picturesque from the outside, but a closer view shows dirty, narrow streets and houses without windows in front. The insides of the buildings, however, are often gorgeous, with vaulted ceilings, rich mouldings, inlaid mirrors and massive gildings. The mosques and bazaars are the most noticeable of the buildings. Though the former great traffic of Bagdad has been greatly cut off since Persia began to trade with Europe through Trebizond on the north and by the Persian Gulf on the south, the bazaars are still filled with the produce of both Turkish and European markets, and many European houses keep agents in the town. Red and yellow leather, silk and cotton goods are manufactured, and dates, wool, grain and timbac (a substitute for tobacco) are exported. Rain does not fall for more than twenty or thirty days during the year, but when the snows melt on the hills of Armenia, the Tigris is filled, and floods often lay waste the country. In 1831 a flood destroyed half the town and several thousand people. Bagdad is sometimes visited with the cholera, from which disease 4,000 people perished daily for several days in 1830.

Discoveries around Bagdad have shown that it dates back to the time of Nebuchadrezzar. About 754 it became the seat of the Mohammedan empire, and was long famous as the home of the caliphs. The Caliph Haroun-al-Raschid and his son in the 9th century greatly improved the city and made it the seat of Arabic learning and literature. It has been frequently taken by the Turks and Persians. While at one time its population was estimated at 2,000,000, it is reported now to have only 150,000, made up of Turks, Arabs, Christians, Jews, Armenians, Hindoos, Afghans and Persians. The province or vilayet of Bagdad (in Mesopotamia), lying between Persia and Arabia, includes the greater part of the basin of the lower Tigris and Euphrates—

area, 54,540 square miles. The population of the province is about 615,000.

**Bagehot** (*băg'ŭt* or *băj'ŭt*), **Walter,** a noted English economic writer and *littérateur*, was born at Langport, Somersetshire, February 3, 1826, and died there March 24, 1877. He graduated at the University of London in 1848, studied law, and was called to the English bar. Instead, however, of making law his profession, he joined his father in banking, and was soon recognized as an authority in finance, and widely known as an accomplished writer and critic. From 1854 to 1863 he was one of the editors of the *National Review*, to which he contributed many able papers on literary, biographical and theological subjects. At the *Review's* decease he wrote for *The Fortnightly*, and between the years 1860 and 1877 was editor of *The Economist*. He published a number of widely-known books, among which are a text-book on *The English Constitution; Lombard Street*, a description of the money market; *Physics and Politics*, "a work which does for human society what the *Origin of Species* does for organic life;" and three volumes entitled respectively, *Literary Studies*, *Economic Studies* and *Biographical Studies*. The latter was not published until after Bagehot's death, when it appeared, edited by R. H. Hutton.

**Bag'pipe,** a wind instrument still common in the highlands of Scotland, and in use in some other countries. At different times it has been used in all parts of Europe. It is a large bag made of leather, usually covered with cloth, having a mouth tube by which the player fills the bag with his breath. There is a pipe with finger-holes upon which the tune is played, and also three other pipes called drones, each of which constantly sounds a single low tone. Sometimes a bellows is used instead of the piper's breath to blow up the bag. The bagpipe is a very ancient instrument. It is spoken of in the Old Testament, and was used by the Egyptians, Greeks and Romans. It is the national instrument of the Scottish Highlanders, pipers being attached to their regiments and usually present at their festivals.

**Baha'mas,** a chain of islands belonging to Great Britain, stretching nearly 600 miles in a northwesterly direction from Hayti to Florida. There are twenty-nine islands, 661 islets and 2,387 reefs, occupying an area of 5,450 square miles. The population of the islands is about 58,175, of whom 6,500 are Europeans. Many woods and valuable fruits grow there, and the main trade is in oranges, pineapples, salt and sponges. The Bahamas were the first land discovered by Columbus (1492), but the exact spot of his landing is doubtful. Cat Island and Watling's Island or San Salvador each claim the honor. Nassau is the capital. The constitution calls for a governor, an executive council of nine and a representative assembly of twenty-nine.

**Bahia** (*bä-ē'ä*) or **San Salvador** is the capital of the state of Bahia in Brazil, and the second city in the republic. It lies on the east shore of the Bay of All Saints, one of the finest bays in America. It is built partly on the shore and partly on high ground, and the two parts of the city are connected by steps and a hydraulic elevator. It has a university, exchange, arsenal and a national dockyard, over sixty churches and many other public institutions. It has a railroad to the interior and connection with several cities by submarine telegraph. It exports sugar, coffee, rice, cocoanuts, cotton, dyestuffs, fancy woods and diamonds. Bahia is the oldest city in Brazil. The bay was discovered in 1503 by Amerigo Vespucci, and the city was founded by a Portuguese navigator, named Correa, in 1510. It is visited by yellow fever and other epidemics yearly. Population is about 230,000, and that of Bahia state is 2,117,956, with an area of 164,643 square miles.

**Baikal** (*bī-käl'*), **Lake,** a large and very deep body of fresh water in Siberia, Russia in Asia, lying north of Mongolia and the vast range of the Altai Mountains. It is situated in the Department of Irkutsk, in latitudes 51° to 55° N.; longitudes 103° to 110° E., and is fed by numerous streams from the Baikal Mountains, a spur of the Altai Range. It has several outlets, the chief being the Angara River, a confluent of the Yenisei. The Trans-Siberian Railroad which connects St. Petersburg *via* Manchuria with the ports of Vladivostok, Dalny and Port Arthur on the Pacific, formerly crossed Lake Baikal, the trains being transported across the lake on an ice-breaking ferry-boat. The area of the lake, which is crescent-shaped, is estimated at 13,000 square miles, with a shore line 1,000 miles in length. Its depth off its southwest shore is close upon 4,500 feet, over 2,800 feet below the level of the ocean. It abounds in fish, including salmon, sturgeon and fresh-water seals. Steamboats have of recent years begun to develop trade on the shores of the lake, which are rich in mineral springs and petroleum wells. The region is subject to earthquakes.

**Bainbridge, Commodore William,** an American naval officer, who did staunch and loyal service during the War of 1812, was born at Princeton, N. J., May 7, 1774, and died at Philadelphia, July 28, 1833. His career as a naval commander dates from 1798, when the United States navy was recognized. Early in the century he was actively engaged in the Mediterranean in successive command of the frigates *George Washington*, *Essex* and *Philadelphia*, was once captured by the French, and had to

surrender his ship in the United States war with Tripoli. When the War of 1812 broke out, he was given command of a squadron, consisting of the *Constitution*, *Essex* and *Hornet*, which sailed from Boston in that year. When cruising off the coast of Brazil toward the close of 1812, he captured the British frigate, *Java*, of 49 guns, for which Congress voted him a gold medal, together with a share in the prize-money. During the remaining months of the war he had charge of the Charlestown Navy Yard; and from 1815 to 1821 he was again in command of a squadron at sea. Later on, Commodore Bainbridge acted as president of the board of navy commissioners.

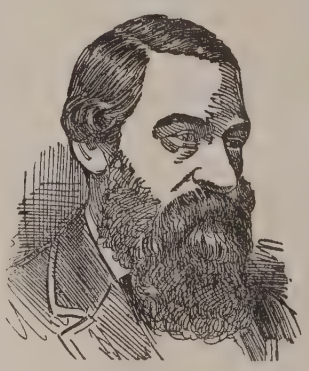
**Baird, Spencer Fullerton,** a noted naturalist, was born at Reading, Pennsylvania, February 3, 1823. He was educated at Dickinson College, Carlisle, and was afterward professor of natural science in the institution. He was secretary of the Smithsonian Institution, at Washington, and afterward commissioner of fish and fisheries. He wrote many papers on birds, reptiles, fishes, etc., and under his direction the National Museum was begun in 1850. In connection with other editors he published *The Birds of North America*, *The Mammals of North America* and a *History of the Birds of North America* in five volumes. He died at Wood's Holl, Mass., August 19, 1887.

**Baireuth or Bayreuth** (*bī'roit'*), famous as the home of Wagner and Jean Paul Richter, is a city of Bavaria, on the Red Main. Its population is about 30,000. The most interesting sight in Bayreuth is the national festival theater, designed by Richard Wagner, and opened in 1876 with a performance of his *Ring of the Nibelungen*. This theater is devoted to music; and the audience is expected to be silent and refrain from applause during the performances.

**Baker, Alfred, M. A.,** professor of mathematics in the University of Toronto since 1887. Born in Toronto, of Yorkshire parents. Was educated at Toronto Grammar School and University of Toronto. Appointed mathematical tutor in University College, Toronto in 1875; registrar, 1880; dean of residence, 1884; elected by graduates a member of Senate of University of Toronto 1887–1906, in last year becoming a member ex-officio. Fellow of the Royal Society of Canada; member of the *Societé Mathematique de France* and of the American Mathematical Society; president of the Ontario Educational Association 1895; president of Section III Royal Society of Canada, 1905; member of Executive Committee British Empire League in Canada and of Navy League. In 1904, in conjunction with Dr. Seath, he reorganized geometrical teaching in the schools of Ontario. He has published articles relating to *Geometry of Position*, *Quaternions* and *Foundations of Geometry*, in proceedings of Royal Society of Canada, the last named article being translated into Japanese; also elementary treatises on *Analytic and Synthetic Geometry*, *Trigonometry* and *Mechanics*.

**Baker, Edward Dickinson,** an American senator and soldier. He was born in London in 1811, and came to the United States when three years old, living first at Philadelphia and then at Belleville, Illinois. He practiced law in Springfield, Illinois, when he was elected to the legislature, state senate and finally to the house of representatives. In 1846 he resigned his seat in Congress to become colonel of a regiment of volunteers from Illinois in the Mexican War, and was present at the siege of Vera Cruz, and commanded a brigade at Cerro Gordo. He was elected to the United States senate from Oregon in 1860. At the breaking out of the Civil War he was appointed colonel of a regiment he had raised in New York and Philadelphia. He was killed when in command of a brigade at the battle of Ball's Bluff, October 21, 1861.

**Baker, Sir Samuel White,** an African traveler, was born in London in 1821, and educated there and in Germany. He superintended the building of the railroad which connects the Danube with the Black Sea. In 1860, with his wife, a Hungarian lady of great talent, he entered upon an exploring journey to discover the sources of the Nile. Starting from Khartum, with an escort of 90 men, 29 camels, horses and asses and three large boats, he ascended the White Nile. He met the explorers Speke and Grant, who reported their own discovery of the Lake Victoria, and told him of another large lake called by the natives Luta Nzige. He resolved to reach this lake, and after many adventures, on March 4, 1864, from the top of lofty cliffs, he saw the vast inland sea, to which he gave the name of Albert Nyanza. During 1869–73 he commanded an expedition organized by the khedive of Egypt to suppress slavery and to annex the equatorial regions of



SIR SAMUEL WHITE BAKER

the Nile Basin. He published *The Rifle and the Hound in Ceylon*, *The Albert Nyanza as I Saw It*, *Ismaila* and *Cast up by the Sea*. He died at Newton Abbot, England, December 30, 1893.

**Baking Powder,** a combination chemically prepared, of tartaric acid and bicarbonate of soda, mixed with flour for the making of bread, biscuits, cakes, etc. The powder, when water is added, causes the bread to rise, as in the olden method of making bread by the fermenting of yeast. Some bakers substitute the bicarbonate of ammonia for that of soda, which is unobjectionable; though the use of alum in lieu of tartaric acid is objectionable if one desires to have wholesome bread.

**Baku** (*bä-kōō'*), a province of Russia, in Transcaucasia, situated on the western shores of the Caspian Sea, southeast of Tiflis and north of the rivers Kur and Aras, the latter separating Russia in Asia from Persia. Area, 15,061 square miles; population of province (1910), 1,013,900, and of the city (in 1909), the seat of administration for the Transcaucasian region, 177,777. The province in 1806 passed from Persian to Russian control, though the population largely remains Tartar and Armenian rather than Russian. There is a good harbor at the port of Baku, of importance to Russia as a naval station on the Caspian Sea and utilized as shipbuilding yards, as well as a port for the shipment of petroleum, the chief product of this region, and the yield of which is estimated at about nine million tons annually. Just north of the port is the great oil-well emporium and refineries, known as the Black Town, where, besides the crude oil works, are a number of chemical works, mills and tobacco factories. Much of the trade of Persia passes into Russia and western Europe through the port of Baku. Here spouting wells of petroleum may be seen all about, many destructive fires frequently occurring from the easily igniting gases as well as from the large areas of oil-saturated land.

**Ba'laam,** a Midianite, the son of Peor, who was hired by Balak, King of Moab, to curse the children of Israel while the latter were encamped in the land of Moab on their way to the Promised Land. Although Balaam made three attempts to pronounce the curse desired by Balak, he was each time constrained by the Lord to bless instead of curse. Balaam was afterward killed by the Israelites in a war with the Midianites. See *Numbers* XXII–XXIV, also XXXI.

**Balaklava** (*bä'lä-klä'vä*), a small Russian fishing village in the Crimea, near Sebastopol. In the Crimean War the British made it their headquarters and began building a railroad to Sebastopol. It was attacked by the Russians, October 25, 1854; but they were repulsed. During this attack the famous charge of the light brigade was made. Upon a probably mistaken order, Lord Cardigan led his light brigade of 600 men against a large force of Russians. With great bravery they cut their way to the Russian guns, but finding that they could do nothing there, turned and cut their way back again. Only 150 men survived the brilliant but fruitless charge. Tennyson's ode in commemoration of it is well known. The English left the town in June, 1856.

**Balanced Ration,** the daily food of farm animals containing the proportion of tissue-producing and heat-producing food-elements calculated to give the best results under different conditions of development and requirements of work. The first sort of foods are the nitrogenous (protein) foods, of which egg-albumen and wheat gluten are familiar types drawn from human foods. The second includes the carbonaceous foods, as starches and sugars (carbohydrates) and fat, or, more strictly speaking, materials soluble in ether (ether extract). Protein can also furnish heat, but, being so much more expensive, the feeder's problem is to add as much carbonaceous food as will supply the necessary heat and also, if the animal is intended for food, as can be converted into fat. The proportion of protein to heat-producing elements is called the nutritive ratio. When the proportion of heat-producing elements is large, the ratio is said to be wide; when small, it is narrow. Thus timothy hay and oat-straw, with proportions of 1 : 16.7 and 1 : 34, are examples of wide ratios. Soy beans, 1 : 1.9, have a narrow ratio. Corn, 1 : 10, has a medium ratio. For growing cattle a balanced ration is about 1 : 4.5; for fattening cattle, 1 : 6; for heavily worked horses, 1 : 6; for light-worked horses, 1 : 7. It is no more important to know the amount of these materials in a ration than to know the percentage of their digestibility. The results of the many analyses and experiments in feeding have been embodied in the Wolff-Lehmann feeding standards, which form the basis of all calculations of the feeding value of different food compounds used by stockmen. See Henry's *Feeds and Feeding*.

**Balboa** (*bäl-bō'ä*), **Vasco Nunez de,** a Spanish conqueror, was born in 1475. He crossed the ocean and began farming in St. Domingo, but fell into debt and to escape his creditors smuggled himself on board a ship and joined an expedition to Darien in 1510. An insurrection which took place there gave him the chief place in the new colony. Rumors reached him here of a great western ocean, and in 1513 he set out in search of it. On Sep-

tember 25, 1513, he first saw the Pacific Ocean from a peak of Darien. Owing to intrigues against him, Balboa was obliged to give up his command, but undertook many successful expeditions while in a subordinate position. Davilla, however, who succeeded him as commander, envious of his success, accused him of plotting a rebellion, and had him beheaded in 1517.

**Bal'der,** the beautiful god of light in the Norse mythology. He was the son of Odin and Frigg and was beloved of gods, men and nature. Through a charm Balder was made incapable of injury from any object save the mistletoe. Loke, the god of fire, jealous of Balder, found out through deceit the one thing which could injure him, and persuaded the blind god Hoder to throw at him a weapon made of mistletoe. Balder was slain, and the twilight of the gods began. A messenger was sent to the lower world to beg for the return of Balder. The promise was given that he would be permitted to return if all things, both animate and inanimate, would weep for him. Loke, in the disguise of a giantess, refused to weep and so Balder remained in the lower world. See Anderson's *Norse Mythology*, and Bulfinch's *Age of Fable*.

**Bald'win, James Mark** (1861), American psychologist, was born at Columbia, S. C., in 1884 graduated from Princeton, and subsequently studied at Leipsic, Berlin and Tübingen. In 1886-87 he was instructor in German in his *alma mater*, and in the two following years he was professor of philosophy at Lake Forest University, occupying the same chair from 1889 to 1903 in the University of Toronto, Canada. Subsequently he devoted himself to psychological studies, gaining prominence in the science and making a number of contributions to its varied branches; while at the same time filling the chair of psychology at Princeton. In conjunction with Professor Cattell of Columbia he founded the *Psychological Review*, and in 1901 became editor-in-chief of the *Dictionary of Philosophy and Psychology*. His other publications, besides his translations from French and German, include *A Handbook of Psychology*, in two volumes (1888), *Elements of Psychology* (1893), *The Story of the Mind* and *Social and Ethical Interpretations in Mental Development* (1897–98). He made many original discoveries and reasearches in his own special department of work, and contributed a number of articles to reviews and encyclopædias.

**Baldwin, Hon. Robert,** born in city of Toronto, 1804, of Irish descent. His father, the Hon. W. W. Baldwin, was a member of the Parliament of Upper Canada. Practiced law very successfully and profitably from 1825 to 1848. First elected to the Upper Canada Legislature in 1829, The executive, although in a minority, rejected year after year the legislation of the Legislative Assembly. He became the champion of responsible government. Lord Durham supported him and oligarchical rule was doomed. He was a member of the executive council in 1836. In 1840 he became solicitor general. In 1842 be became attorney-general in Upper Canada. Mr. Lafontaine was attorney-general in Lower Canada. Hence, the name of "Baldwin-Lafontaine Government." Held the position until 1851. Died 1858. Called the father of responsible government in Canada.

**Bal'ear'ic Isles** (*băl'ê-ăr'ĭk*), a group of islands lying off the Mediterranean coast of Spain. They are Majorca or Mallorca, Minorca, Iviza, Formentera, Cabrera and several islets. From 1232 to 1344 they formed the kingdom of Mallorca, but in 1349 were united with the kingdom of Aragon. They now form a Spanish province, Balleares, with an area of 1,935 square miles, where vines, olives and fruit trees are abundant. Port Mahon, in Minorca, is one of the finest harbors in Europe. The Phœnicians and Greeks visited the islands in early times. Later they were subject to Carthage, but were added to the Roman empire in 123 B. C. The natives were famous slingers and their name, Baleares, comes from the Greek word meaning "to throw." Population, 311,649.

**Balfe** (*bălf*), **Michael William,** a musician and composer (born 1808, died 1870). He studied under various masters, and in 1826 wrote his first work, *La Perouse*, which was performed at Milan. In the same year he sang in Italian opera at Paris, and later conducted the London Italian opera. His most successful operas are *The Bohemian Girl*, *The Rose of Castile* and *The Talisman*. Many of his songs are favorites.

**Balfour** (*băl'fōōr*), **The Right Hon. Arthur James,** an English statesman and prime-minister (1902–05), was born July 25, 1848. He was educated at Cambridge University, and in 1874 entered parliament as a member of the Conservative party, and during 1878-80 he was private secretary to his uncle, Lord Salisbury. He was president of the local government board (1885), secretary for Scotland (1886) and chief secretary for Ireland (1887), and then filled the important position of leader of the Conservative party in the House of Commons. In July, 1902, on the retirement of Lord Salisbury, Mr. Balfour became prime minister, a post he held until the close of 1905, when he resigned the premiershp and was succeeded by the Liberal leader, Sir Henry Campbell-Bannerman. He is a fine scholar, a man of letters, a metaphysician and a

# THE BALKANS AND THE PEACE OF EUROPE

PALACE OF THE SULTAN, CONSTANTINOPLE

## Relation of the Balkan War of 1912-1913 to the World-Wide Conflict of 1914.

### *History Shows the Underlying Causes of Both Wars Were Many Centuries Old—How the Lesser War Brought on the Greater.*

THE prophecy of danger to the peace of Europe in Servia's feeling of resentment toward Austria, contained in the following article on the Balkan situation which originally appeared in the revision of *The Student's* a year previous to this terrible crisis, was fulfilled almost to the letter by the rapid chain of events following Sunday, June 28, 1914, when the Crown Prince of Austria and his wife were assassinated by Gabrilo Prinzip, a student, in Sarajevo, Bosnia. Austria charged that Servian officials had plotted the assassination and demanded that Austrian officials be permitted to enter Servia and participate in an investigation. This Servia, disclaiming all responsibility for the assassination, refused to permit, as being a surrender of her independence, but proposed arbitration.

Austria thereupon declared war on Servia, and the consequent military activity of Russia led Germany to declare war upon her under the Dreibund and also upon France as Russia's ally under the Dual Alliance.

Underneath the immediate causes of this most gigantic struggle in history lie national ambitions and racial sympathies and antipathies reaching back for centuries; and the student should read carefully our articles on each of the countries involved, as given in the History Outlines and also, among others, "Franco-German War" (707), "Great Powers of Europe"—(799).

To understand the Balkan war of 1912-13, which changed every boundary line in the peninsula, and the vital interest of six great European powers in the terms of peace, it is necessary to go back to a time before Columbus. When the Turks took Constantinople, in 1453, after having occupied Adrianople for a century, the old Roman Empire of the East was abandoned to Moslem hordes. The Christian peoples of the Balkans were left to defend themselves. Dividing along racial lines they fought under their native leaders. Even after they were conquered, they continued to resist Turkish misrule and religious persecution. For three hundred years Bulgaria, and Servia which then included Montenegro and Northwestern Turkey, stood as a bulwark between the Turk and Western Europe. Montenegro separated from Servia, and its 250,000 mountaineers maintained their independence. In 1830 England, France and Russia helped Greece in her struggle for freedom, chiefly because of the sympathy for the ancient glory of Athens. With Russia's assistance Roumania became an independent kingdom.

In 1876 the Turks entered upon a series of massacres of Christians in Bulgaria. Russia, coming to the defense of the Greek Catholics, made war on Turkey, and would have taken Constantinople had she not been stopped by the other powers. The

MONTENEGRIN ARTILLERY AND EARTHWORKS

MONTENEGRIN GENERAL WATCHING BATTLE

KING NICHOLAS OF MONTENEGRO

THE SULTAN, MEHMED V.

KING FERDINAND OF BULGARIA

KING PETER OF SERVIA

LATE KING GEORGE OF GREECE

KING CONSTANTINE I. OF GREECE

position of this commanding site on the Bosphorus has, in turn, made the Persians, Gauls, Greeks, Romans and Turks mistress of the Eastern Mediterranean. Its possession today by any strong government would disturb the balance of power of all Europe. All questions could have been settled satisfactorily by the treaty of Berlin, in 1878, had Constantinople been given to Turkey and the rest of Moslem territory divided up among the Balkan States. But by the jealousies and mischievous interference of the powers, Bulgaria and Servia were allowed a smaller measure of liberty and territory than they had won, and Turkey was continued in misrule over many Christian peoples. Thus a situation was created that menaced the peace of Europe for thirty-five years. Then, instead of keeping order in Turkey as they had promised to do, it became the policy of the countries in the Triple Alliance to profit by the growing feebleness of the Turkish government. Austria annexed Bosnia and Herzegovina, old Servian provinces on the Adriatic. Germany got railroad concessions in Asia Minor, and Italy occupied Tripoli, a Turkish possession in Africa. When all the resources of Turkey were engaged in a war with Italy and a revolution at home, the Balkan States saw their opportunity to reassert their rights.

As early as February, 1912, Bulgaria, Servia, Montenegro and Greece entered into a secret alliance to drive Turkey out of Europe. Every detail of the plan was well

UNIFORM OF TURKISH SOLDIER

TYPES OF MONTENEGRIN RESERVISTS

UNIFORM OF THE ALLIES

MONTENEGRIN MOUNTAIN CHIEFS IN PROCESSION, PRECEDED BY CRIER

TURKISH CAVALRY ON THE MARCH

thought out, and military genius shown in the thorough preparations for war. On the eighth of October Montenegro declared war on Turkey. By the seventeenth all four armies were in the field, each with an objective nearest its own boundary. The Greeks, with fleet and land forces moved on Saloniki and Janina. The Bulgarians marched toward Adrianople, "jewel of the Orient," and the old Moslem capital. The Servians attacked Novi Bazar and protected the rear of the 40,000 Montenegrins who besieged Scutari. This was the Turkish stronghold perched on the rocks above the old Servian port on the Adriatic.

The allies were warned by the powers that they would not be allowed to keep any conquered territory. But a series of swift victories paralyzed Turkish resistance and obliged the powers to change their tone. France proposed to let the Balkan States divide Turkish territory in Europe, leaving to Turkey only Constantinople and a strip of seacoast. These terms were accepted at the peace conference in London, late in January, but were repudiated by an overthrow of the Turkish government. War was renewed in February. Adrianople and Janina fell in March. Scutari was captured in April. Montenegro and Servia, however, were robbed of the fruits of this victory. Austria had demanded that this seaport should become a part of the newly created State of Albania. Some color of justice was given to this demand by the fact that the Albanians too have struggled for freedom for centuries. The other powers agreed, in the interests of European peace. By the terms as finally concluded, Turkey loses 60,000 square miles and has only about 5,000 square miles left in Europe. Montenegro and Servia submitted to overwhelming force again, as in 1878. But here is a seed of discontent that may germi-

MONTENEGRINS IN CAMP

THE CROSSES ON THE FOREHEADS OF THESE BULGARIAN PEASANTS ARE SUPPOSED TO PROTECT THEM FROM THE TURKS

nate a future war. Servia is in desperate need of an outlet for her trade, on the Adriatic, and may get it through reunion with Montenegro. Austria is suspected of an intention to annex Albania; but to this the Balkan countries are not likely to submit. It was the dream of M. Stambouloff, the late Bismarck of Bulgaria, to unite all the States of the peninsula into a Balkan republic. Europe has this possibility, of having to admit a seventh power into its councils, to reckon with.

BULGARIAN PEASANTS LAYING FOOD, AS A SACRIFICE, ON GRAVES

VIEW OF CETINJE, CAPITAL OF MONTENEGRO, SHOWING HOW THE BALKAN PEOPLE ARE DEFENDED BY THEIR MOUNTAINS

brilliant debater. He has shown himself cool, clear-sighted, quick to think, speak and act. He is the author of quite a well-known work called a *Defense of Philosophic Doubt*. Besides this work he has published (1905) a volume of essays and addresses. During the European War he was first lord of the admiralty, later foreign secretary and was a member of the commission sent by the Allies to the United States.

ARTHUR JAMES BALFOUR

**Balfour, Francis Maitland** (1851–1882), brother of Arthur. A highly gifted young naturalist, educated at Trinity College, Cambridge. His investigations, especially in the line of embryology, were of great importance. Between 1879 and 1882 he brought together all that was known about the developmental stages of animals in his *Comparative Embryology*, a work of almost priceless value to students of embryology. In 1882 he and his single guide were killed on the Alps by slipping while attempting to climb one of the spurs of Mont Blanc.

**Balfour, Rt. Hon. Gerald W.,** another nephew of the late Marquis of Salisbury and brother of Arthur J. Balfour, entered the English Parliament in 1885, and in the third Salisbury administration he was appointed chief secretary for Ireland, having much to do with the passing of the Irish Land Bill (1895) and the extension of local government to Ireland in 1898, including the creating of a department of agriculture and technical instruction on the island. Subsequently, he was president of the English Board of Trade..

**Baliol** (*bā'lĭ-ŭl* or *băl'-yŭl*), **John,** king of Scotland, was born in 1249. Through his mother he was connected with the royal family, and on the death of the heir to the throne, the Maid of Norway, he became a competitor for the throne with Robert Bruce. The question was left to Edward I of England to decide. He chose John Baliol, who swore obedience to him as his feudal lord. In consequence of his oath, he soon found he had no real power, but had to endure whatever Edward I put upon him. In 1295 he made a treaty with France, which was then at war with England. Immediately Edward invaded Scotland, and taking Baliol prisoner, compelled him to give up his crown. In 1302 he was allowed to settle on some estates of his in Normandy, where he died in 1315.

**Balize.** See BELIZE.

**Balkan** (*bal-kän'*) (the ancient Hæmus), a mountain range that separates the waters of the lower Danube from those that flow into the Ægean Sea. The name is also given to the whole mountain system from the Adriatic to the Black Sea. The main chain has an average height of 4,000 or 5,000 feet, and rises in various parts to a height of 7,000 to 8,000 feet. Toward the east it is broken into a number of chains and ridges running parallel to each other. Scardus, the highest mountain, is 9,700 feet above the sea. Most of the rivers on the northern side flow into the Black Sea, while those on the south fall into the Mediterranean. There are many passes through the mountains, but most of them are very difficult to traverse. The mountains are mostly of granite-like rock.

**Balkan Peninsula,** that part of Europe having the Adriatic and Mediterranean Seas on one side and the Ægean and Black Seas on the other. It includes Rumania, Bulgaria, Servia, Turkey, Greece, Montenegro and Herzegovina. Nearly the whole of the peninsula is mountainous, the chief plains being those along the Danube River. There is great variety of climate, both as to the range of temperature and the amount of rainfall. Much of the land in the east and south depends upon irrigation to make it productive. The industries are chiefly cattle-raising, agriculture, fruit-growing and manufacturing, the latter being carried on largely by hand. The country is rich in minerals, but mining is little developed because of the repressive government to which the people were so long subjected. The total population is about 17,000,000, and nearly half of the people are Slavs.

**Ball, Sir Robert Stawell,** British astronomer, one of the most popular scientific lecturers of the day, and one of the few who can invest abstruse subjects with fascinating interest. He was born at Dublin on July 1st, 1840. He has been successively professor of mathematics in the Royal Irish College of Science, astronomer royal for Ireland and Lowndean professor of astronomy and geometry at Cambridge. His writings include an *Atlas of Astronomy*, *Story of the Heavens*, *Time and Tide* and *The Story of the Sun*.

**Bal'lad,** originally a song sung or acted in a dance. The name is used for any simple narrative poem of short stanzas in which a story is told in a forcible, straightforward manner. Ballads are found among all European nations, and belong to times when, in the nation to which they belong, life was simple and civilization not so far advanced as English civilization is at

present. Percy's *Reliques of Ancient English Poetry* and Sir Walter Scott's *Minstrelsy of the Scottish Border* are famous collections of these old English and Scottish ballads. The ballad of *Chevy Chase* is probably the most famous in the English language. The story of Robin Hood was also a favorite subject of popular song, and has been sung in various forms.

**Bal'larat',** a large Australian town, next in importance to Melbourne, is in the province of Victoria. It owes its rise to the discovery of the goldfields there in 1851, being the oldest but one of the gold fields of the colony. It is in the center of one of the richest gold fields of the world. The largest gold-nugget ever discovered was found here in 1858. It was sold for over $50,000. In 1910 about 16,553 men were employed in the gold fields of Victoria colony, 2,000 of whom were Chinese. Population 50,000.

**Balliol** (*băl'-yŭl*) **College,** Oxford, is at present probably the most important of the colleges of Oxford University. It was founded about the middle of the 13th century. The greatest of its masters in the middle ages was John Wiclif; and, perhaps, in the 19th century Jowett and Caird. Among poets, Balliol College has educated Southey, Matthew Arnold, Clough and Swinburne. The philosophers, T. H. Green and Sir William Hamilton, were men of Balliol; as was the late Archbishop Temple. There are about 600 names of members on the books.

**Balloon.** See ÆRONAUTICS.

**Ball's Bluff,** a bluff on the Virginia side of the Potomac, thirty miles from Washington, was the scene of a battle in the Civil War, October 22, 1861. A small force of Federal troops was surrounded by a larger Confederate force. The Federals were defeated, and a large number were killed or captured, among the killed being the commander, Col. E. D. Baker. See BAKER, EDWARD DICKINSON.

**Bal'moral,** a home of the English royal family in Scotland. It is 926 feet above the sea, on a plain that slopes from a height of 1,437 feet to the River Dee, and lies 45 miles west of Aberdeen. In 1852 the prince consort, husband of the late Queen Victoria, bought the estate for $160,000, and built a new granite castle in the Scottish baronial style, which cost about $500,000. The estate now includes about 25,000 acres.

**Baltic** (*bal'tĭk*), **Battle of the,** a naval battle between the English and Danish fleets in the harbor of Copenhagen, April 2, 1801. The English fleet, under Sir Hyde Parker, with Lord Nelson second in command, was ordered to the Baltic to break up the alliance just formed between Russia, Prussia, Denmark and Sweden. Nelson led the attack, and when Parker gave the signal to stop the fight, Nelson put the glass to his blind eye, and said he could not see the signal. He continued the attack and captured or destroyed nearly the whole Danish fleet. His victory helped greatly to break up the alliance.

**Baltic Sea** is the great inland sea, bordered by Denmark, Germany, Russia, Finland and Sweden. It is nearly 900 miles long, from 100 to 200 miles broad, and 40 to 140 fathoms deep, and has an area, including the Gulfs of Finland and Bothnia, of 184,496 square miles, over 12,000 square miles being occupied by islands. The great number of islands, the sudden changes of wind and the violent storms make navigation very dangerous. The main gulfs are those of Bothnia, Finland and Riga. About 250 rivers flow into it, which makes the sea much more nearly fresh water than other bodies of salt water. For this reason it freezes easily, so that navigation is interfered with from three to five months in the year. The chief rivers are the Oder, Vistula, Niemen, Düna, Narva and Neva. The shipping-trade is large, the exports of the countries around the Baltic being timber, hides, tallow and grain. The Eider and Gotha Canals connect the Baltic and the North Sea. A larger canal for ships from the mouth of the Elbe to Kiel Bay was begun in 1887 and completed in 1895. It cuts the base of the peninsula of Jutland through Schleswig-Holstein. It is about sixty miles long and saves a dangerous voyage of about 600 miles. Another projected canal is a Russian enterprise, which is designed to connect the Gulf of Riga with southern Russia at Kherson, north of the Crimea. It will utilize the water ways of the Düna and the Dnieper. The most important harbors on the Baltic are Copenhagen, Kiel, Lübeck, Stralsund, Stettin, Dantzic, Königsberg, Memel, Riga, Narva, Kronstadt, Sveaborg, Stockholm and Karlskrona. A noticeable feature of the Baltic is the slow vertical movement of its coasts downward in the south of Sweden and an upward movement farther north. Its area is said to be gradually decreasing. The Germans call it the East Sea. The Baltic is connected with the Cattegat and the North Sea by the Sound and the Great and Little Belts.

**Baltimore,** known also as the Monumental City, is the metropolis of Maryland and the largest town on the Atlantic seaboard south of Philadelphia. The city is at the head of navigation on the Patapsco River, fourteen miles from the Chesapeake Bay. It is on the highway of travel between the cities of the east and those of the south and west, being 38 miles from Washington and 97 miles from Philadelphia. Baltimore is an important shipping port, a large railroad center and a rapidly growing manufacturing town. The Patapsco ex-

pands just below the city, affording an extensive and safe harbor, with an outer bay which is able to accommodate the largest ocean steamships and an inner harbor or basin for small coastwise and bay crafts. Thirty-two steamboat and steamship lines connect the city directly with Liverpool, Bremen, Rotterdam and other foreign ports, and with nearly all the bay and river towns of Maryland and Virginia as well as the larger American seaports of the Atlantic. The city is on the main line of the Baltimore and Ohio Railroad between New York, Washingon and the west; it is on the Philadelphia-Washington division of the Fennsylvania Railroad; and is the terminus

of the Northern Central Railway, a branch of the same system. The city is the terminus of the Western Maryland Railroad—the outlet of the Shenandoah and Cumberland valleys—which has been made a part of the Wabash system; and it is also the terminus of both the Maryland & Pennsylvania and the Baltimore & Annapolis Railways. The city has direct connections, too, with the Southern Railway, the Atlantic Coast Line and the Seaboard Air Line.

Baltimore is the youngest of the great American cities on the Atlantic coastline. The city, consisting then of sixty acres, was first laid out in 1730, and was created upon the petition made a year earlier by certain residents upon the Patapsco to the Maryland legislature. In 1732 another town was started across a small stream from Baltimore-Town, and this settlement took the name of Jones' Town, from the stream—Jones' Falls. The two towns were consolidated in 1745; and Baltimore was enlarged from time to time thereafter until with the large addition gained by the taking in of the Annex in 1888 it now covers 31½ square miles. The city was called after Cecilius Calvert, Lord Baltimore and one of the proprietaries of the province of Maryland. It was originally included in Baltimore County, and became the county seat in 1767. Subsequently, however, the city and county were divorced, and Baltimore today has an independent government from the county by which it is surrounded. During the Revolutionary War Baltimore became an important center, and for a while housed the Continental Congress, after that body was forced to retire from Philadelphia. In 1780 Baltimore became a port of entry, and in 1796 was incorporated into a city. During the second war with England the city was subjected to two attacks by the British—one by land and the other by sea; but both were unsuccessful. The land attack resulted in the Battle of North Point, (Sept. 12, 1814,) when the British lost their commander, Gen. Ross, and retired without accomplishing their purpose. The following day, September 13, the fleet opened fire upon Fort McHenry—the city's chief defense. The bombardment lasted all day and night, and had the fort been taken Baltimore would have fallen prey to the enemy. But on the morning of the 14th the American flag was seen still flying over the ramparts of the unconquered stronghold, and the enemy abandoned all hope of taking Baltimore. It was the sight of this American flag waving over Fort McHenry that inspired Francis Scott Key, who had been detained by the British during the bombardment, to write America's national anthem—*The Star-spangled Banner.* Shortly after the War of 1812–15 the residents of Baltimore raised two monuments—one to Washington and the other to the defenders of North Point; and these memorials won for the town the name of the Monumental City. The first blood of the Civil War was shed in Baltimore (April 19, 1861), when a mob sought to prevent the passage through the city of the Sixth Massachusetts and the Seventh Pennsylvania regiments, then on their way to Washington in response to Lincoln's call for volunteers. Historically, there are other important events connected with the city of Baltimore: It was the first

American city lighted by gas; the first steam passenger train in America ran from Baltimore to Ellicott City; the first steamship to cross the Atlantic sailed from Baltimore; the first electric telegraph line was strung from Baltimore to Washington; the first paid fire department in America was that of Baltimore; the first school of dentistry in the world was established in the Monumental City; the first iron building was the former home of the *Baltimore Sun;* and the first American Methodist Episcopal church was organized in Baltimore.

On February 7–8, 1904, the entire business section of the city was wiped out by a fire which destroyed $70,000,000 worth of property. The conflagration proved the beginning of a new era in the life of the city. Not only were the destroyed buildings replaced, in most instances by better structures, but the municipality seized the opportunity for extensive improvements. Many important business streets, which had been too narrow to accommodate the heavy traffic imposed upon them, were widened. The two thoroughfares skirting upon the wharf property of the basin—Light and Pratt Streets—were changed from narrow and unattractive streets to avenues of great width. At the same time a new system of modern concrete piers was begun along Pratt Street, ranging in length from 550 to 1,450 feet and having docks 150 feet wide, giving a total surface area of 23½ acres. At the same time a complete sewerage system was undertaken, at a cost of $10,000,000. Enormous sums of money were appropriated for improving the streets and roads of the Annex, while considerable additions were made to the city parks, which include one of the finest natural pleasure grounds of the world in Druid Hill Park.

Baltimore has made great advance as a manufacturing town in the past two decades, and ranks seventh among the manufacturing cities of America. It is the largest city for the slaughtering and packing of meat upon the Atlantic seaboard. The city ranks first in the canning and preserving of fruits and vegetables and also in the canning and preserving of oysters. It ranks third in the manufacture of all kinds of factory-made clothing for men, women and children, and sixth in the hand-trades manufactures. The city is also an important center for the manufacture of tobacco goods, foundry and machine shop products, factory-made furniture. Baltimore is a great export center for both coal and grain.

Baltimore ranks as a foremost educational center. The Johns Hopkins University, opened in 1876, is primarily an institution for graduate and research work, but has also an efficient undergraduate department. The Peabody Institute contains a world-famed historical library and has connected with it a conservatory of music. The Woman's College, the Maryland Institute—School of Art and Design; and colleges of medicine, law, dentistry and pharmacy are located in the city. The public schools are equal to those of any other American city. The Enoch Pratt Free Library—with more than 200,000 volumes and numerous branches—is one of the greatest free libraries in America. The public buildings include the magnificent new Custom-House, the marble Court-House, Walter's Art Gallery—containing one of the finest private collections of paintings in the United States, the Johns Hopkins Hospital—covering several city blocks—and numerous other notable structures. Baltimore is the seat of a Roman Catholic archbishopric and of a Protestant Episcopal bishopric. Population, city and suburbs, 700,000.

**Bal'timore, Lord,** a title of the Calvert family. In 1625 Sir George Calvert was made first Lord Baltimore by James I, and granted land in Newfoundland; but the colony which he founded was a failure. He then petitioned Charles I for a charter to found a new colony, but died (1632) before the charter was issued. His son, Cecil Calvert, second Lord Baltimore, received the charter in June, 1632, and was thus the real founder of Maryland colony. The whole state of Maryland was included in the grant, and Leonard Calvert, a brother of Lord Baltimore, came with an expedition as governor in 1633. Under the Calverts the colony was managed in a wise and tolerant manner.

**Baltimore Oriole** or Baltimore bird, also called Firebird, is a beautiful bird, very common in North America, from Canada to Mexico. The birds come from the south in May, and in trees and vines near houses build their hanging nests of moss and fibers skillfully woven together. Threads, strings and horsehairs are used in building the nest, which is a deep hanging pouch about six inches long. The birds are about seven inches long, with sharp bills, pointed wings and rounded tail. The plumage is beautiful, especially in the males, being a glossy black, mixed with bright orange and yellow. These were the colors of Lord Baltimore's livery, hence the name. Their song is strong and pleasant, a ringing whistle easily imitated. They are valuable for their destruction of insect larvæ, like the tent-caterpillar, canker worm, etc. Lady Baltimore, as the nest builder is called by the author of *Bird Neighbors*, is one of the best architects in the world. Of the splendid male the poet Lowell says: "*Hush! 'tis he! My oriole, my glance of summer fire.*"

**Baluchistan** (*bä-lōō'chĭs-tän'*), a rugged country of southwestern Asia, bounded on the north by Afghanistan, on the south by the Arabian Sea, on the west by Persia and on the east by Hindustan. It has an area of 131,855 square miles.

BALTIMORE ORIOLES AND NEST

*Surface.* Baluchistan is mountainous, but has also broad and high tablelands and some extensive sandy deserts. One of its mountain systems extends north and the other east and west. Many of the mountains have great height and are snow covered, while the tablelands are very hot in summer and extremely cold in winter. Its most important rivers are the Bolan and Mula, which are located in the northeast.

*Natural Resources.* It is believed that the mineral wealth is quite important, and includes, gold, silver, lead, copper, iron, mineral salts and saltpetre. Throughout the country there is a great scarcity of water, and the soil generally speaking is not fertile. The following articles, however, are produced to some extent: wheat, barley, millet, cotton, rice, indigo and tobacco. Orchard and garden fruits are grown near the towns and vegetables are very plentiful. Attention is given to the breeding of fine camels.

*Manufactures.* The manufacturing interests are unimportant, and consist mainly of coarse fabrics, matchlocks and other weapons.

*Government.* The khan or tribal ruler receives an annual grant from India, and resides at Kelat, while his rule is almost confined to the surrounding country. Quetta is the largest town and has railway connection with India. It is strongly fortified, and is occupied by a British garrison. The country is a British protectorate, and while not wholly under their rule, is completely under British influence. Population over 915,000.

**Balzac** (*băl'zăk'*), **Honore de,** a great French novelist, was born at Tours in 1799. He studied law, but gave it up and went to Paris to try his fortune as an author. For ten years he lived in wretched circumstances, writing stories which were of little value. In his thirtieth year he wrote his first great novel, *The Last Chouan*, which brought him into notice. Soon after he began his great work, called *The Human Comedy*, which was intended to be a complete picture of modern life. He was a very hard worker, and wrote eighty-five novels in twenty years. Few writers have shown such power in describing character and in giving reality and life to their characters. Some of his best works are *Scenes of Provincial Life*, *Scenes of Parisian Life*, *La Peau de Chagrin* (The Magic Skin), *Le Cousin Pons*, *Séraphita*, *Contes Drôlatiques*, *Eugénie Grandet* and *Father Goriot*. He died at Paris, Aug. 18, 1850.

**Bamboo',** a kind of tree-like grass, which grows to a large size in the warmer parts of Asia and America. Some kinds are at least eighty feet high. It is used for a great variety of purposes, such as housebuilding, shipmasts, furniture, spear-shafts and walking sticks. As the stem is hollow and very strong, it is also used for water pipes. In some varieties a sweet juice is found, which in India is used for cooking.

**Banana,** (*bà-nă'nà*), the name of a fruit and also of the plant which produces it. It is thought to be a native of India, but is now grown in all tropical countries. We get our bananas largely from the West Indies and Central America. The fruit is grown extensively in our island possessions, and some is produced in Florida, Louisiana and California. There are many varieties; the one commonly exported is the Martinique, which shows a large bunch of yellow fruit. A delicious variety is the apple banana, a small banana with fragrance and taste of the apple. In Hawaii, just in the home garden of the sugar planter, may be grown fifteen different kinds. Common in tropical countries is a popularly called cooking banana, not edible raw; with thick, salmon-colored flesh and dark skin, similar to the plantain of the South Seas. It is told that the natives of one of the South Sea islands subsist entirely on bananas; on many islands it is the main food. Between the plantain and the banana there is little, if any, botanical difference. Both are *Musa sapientum*. The plantain, a much less familiar fruit, is large, solid and mealy compared with the ordinary banana. The banana is very nutritious and wholesome when thoroughly ripe. The bunches are cut off when green; those for export, so they will ship well; those for home use, to keep them from the birds. They are often hung from the beam of the veranda to ripen. Some bunches grow to enormous size, one occasionally weighing 80 pounds. A small area of land will produce a rich crop.

A plant bears but a single bunch, then the stalk is cut down and the sprouts take its place. When about three feet high, these are transplanted, put far enough apart to allow space for the great leaves that will outspread wide when full grown. The plant or tree varies in height from 10 to 40 feet, and at the top of the stalk the immense, undivided leaves are from six to ten feet long and one to two feet wide. The flower-bearing is most curious; the flower cluster with its tight-overlapping scales is a great elongated purple bud in appearance. Under each scale is a true flower of which there may be over a hundred in each "bud," forming that many bananas as they develop. Under favorable conditions a banana plant bears when from twelve to eighteen months old. Bananas grown for their fruit are perpetuated by root-cuttings, by sprouts and suckers.

**Ban'croft, George,** a distinguished American historian, was born in Worcester, Massachusetts, in 1800. He graduated from Harvard College, and studied two years at Göttingen, Germany. He was tutor in Greek at Harvard for one year, and with a fellow student carried on a school in Northampton

till 1830. The first volume of his *History of the United States* was published in 1834, and two other volumes soon followed. The next five volumes came out from 1852 to 1860, and in 1866 and in 1874 two more volumes were published, which bring the history to the preliminary treaty of peace with Great Britain in 1782. Two other volumes, on the formation of the constitution, appeared in 1882. Bancroft was collector of the port of Boston under President Van Buren; under President Polk he was secretary of the navy and minister to England. In 1867 he was appointed minister to Berlin, where he remained until recalled at his own request in 1874. He died at Washington, D. C., Jan. 17, 1891.

GEORGE BANCROFT

**Bancroft, Hubert Howe,** an American historian, was born at Granville, Ohio, in 1832, and settled in San Francisco, where, in the book business, he made a large fortune. He collected a library of 60,000 volumes, mainly on early American history. He was so fortunate as to secure the library of the Mexican Emperor Maximilian. His well-known work in five volumes, *The Native Races of the Pacific States*, forms the first part of his immense *History of the Pacific States of North America*, complete in forty volumes.

**Banff.** A charming and very fashionable summer resort on the main line of the Canadian Pacific Railway, 922 miles west of Winnipeg and 560 miles east of Vancouver. Famous for its hot sulphur springs and grand majestic scenery. The National Park of Canada is at Banff. The journey from Winnipeg to the Pacific coast is generally broken at Banff.

**Bangalore'** (*băn'gà-lōr'*), a strongly fortified town of Mysore, one of the native states in India, in a district of the same name. When Mysore was occupied by England in 1831, Bangalore was made the capital, and when, in 1881, Mysore was restored to the rule of its native prince, the district of Bangalore was exempted from native control. The city lies 3,000 feet above the sea, and is consequently very healthy. Silk and carpets are the principal manufactures. Population 189,485. The district of Bangalore has a population of 669,139.

**Bangkok',** the capital of Siam, situated on both banks of the Menam. One third the population are Chinese, who control the large trade of the city. For the right to trade there the Chinese pay a poll-tax of about three dollars every third year, which exempts them from the half-yearly military service which all other foreign residents have to give. A large number of the houses are built on rafts in the river. They are made of bamboo boards, wicker work or palm leaves, usually with a veranda in front and a wing at each end. On land the houses are raised on piles six or eight feet from the ground and reached by ladders. The walls of the city are about six miles in circumference. The traffic of the city is carried on mainly by canals, there being only a few streets. Bangkok is the residence of the king of Siam. The palace is surrounded by a high wall, nearly a mile long, which incloses temples, public offices, a theater and accommodation for several thousand soldiers and for about 3,000 women, 600 of whom are the wives of the king. The temples of the city are very numerous, decorated in the most gorgeous style and served by 20,000 priests. The chief exports are rice, sugar, pepper, hides, ivory and feathers, while the imports are tea, silk, opium, hardware, machinery and glassware. The building of steamships, the introduction of gas into the royal palaces and the houses of the noblemen, the starting of a regular mail to the city in 1884, followed by Siam joining the International Postal Union in 1885, show the recent progress. A railway is now running from Bangkok to Paknam (14 miles in length), while one runs from the capital to Korat (165 miles); there are also electric tramways now in the kingdom. Telegraphs connect Bangkok with Burma and Cambodia. Population is 628,675.

**Ban'gor,** a city and port in the state of Maine, on the Penobscot River, about sixty miles from its mouth. The harbor is accessible during the open season to all except the very largest shipping vessels. Bangor is one of the largest lumber stations in the world. About 200,000,000 feet are yearly shipped during the season of eight months. The city has some shipbuilding, several sawmills, furniture factories, foundries, etc. When under the English government it was called Kenduskeag. Its present name was derived from the well-known tune of that name. Population, 24,803.

**Bangs, John Kendrick,** (1862), American humorist, born at Yonkers, New York, and educated at Columbia College. He early took to literature as a profession, and has been connected editorially or as a writer with *Harper's Weekly* and *Magazine*, with *Life*, the *Metropolitan Magazine*, etc. He has written a number of amusing and entertaining books, among the best known of which are *A Houseboat on the Styx, The Pursuit of the Houseboat, Mr. Bonaparte of Corsica, Coffee and Repartee, Uncle Sam, Trustee, The Idiot at Home, The Bicyclers and Other Farces, Toppleton's Client, A Rebellious Heroine, Olympian Nights* and *The Enchanted Typewriter.*

**Banks** (from the Italian *banco*, meaning a bench). The Babylonians and Chinese as

well as the Greeks and Romans are known to have made use of the principles of banking; but the bank of Venice in the 12th century was the first institution which carried on banking business as it is now practiced. The bank of Barcelona was founded in 1401; and one at Genoa, started in 1407, was for centuries one of the first banks in Europe. The bank of Amsterdam (1609) was the great warehouse for bullion during the 17th century, giving receipts for the coin and bullion put there, which receipts were used as money.

Modern banking begins with the 18th century, and the modern bank in its simplest form is an institution which receives money from its depositors and loans it out to borrowers, charging the latter interest for the loan. The difference between the higher rate of interest which the bank charges the borrowers and the lower rate which it pays its depositors is the gross profit which the bank makes.

The money which the bank loans is represented in the bank by notes, which are promises to pay back the money at a certain time and place, signed by the borrowers. In order that the bank may safely loan money it requires the borrower to give security. This may be in the form of an endorsement which is the signature of a person, firm or corporation on the back of the note, and this endorsement makes the endorser guarantee the payment of the note and interest. Other forms of security are stock, bonds, mortgages, etc. If the borrower fails to pay the note when it is due, the bank can then sell the stock, bonds, mortgages, etc., and apply the proceeds in payment of the note.

In the United States banks may be divided into national banks, state banks, trust companies, savings banks and private banks. National banks are organized and operated under the national banking laws, and are examined by national bank examiners who are under the Comptroller of the Currency in Washington, D. C., and make their reports to him. National banks are also required to make sworn statements of their condition to the comptroller whenever he calls for them. State banks, savings banks and trust companies are organized and operated under the banking laws of the states in which they are located. They are subject to examinations by state bank examiners and must make sworn statements of their conditions when the proper state official calls on them to do so. Private banks are not organized under the national or state banking laws and are not subject to the supervision of federal or state officials. When a bank is organized under the national or state banking laws, it is known as a chartered bank, because the national or state government gives the owners of the bank, known as stockholders, a charter which authorizes them to conduct a banking business.

The stockholders supply the money to start the bank, and this money is called the capital of the bank. As the bank prospers, it lays aside a certain amount of its net earnings each year in a fund called surplus. Some banks have a surplus larger than the capital. The capital and surplus belong to the stockholders; but if for some cause the bank should fail—that is, be unable to pay back to the depositors the money they had deposited, then the public authorities take the capital and surplus to pay the depositors what is owing them. If this is not sufficient, an assessment is made on the stockholders, sometimes for as much as the par or face value of the amount of stock they own.

Stockholders of a bank meet each year and elect directors to represent them in the management of the bank. The directors in turn elect the officers of the bank to whom they delegate authority to operate the bank. It is the duty of the directors to see that the bank is properly managed and that the officers conduct the bank's business carefully, safely and properly and with profit, for unless the bank makes a profit it cannot pay dividends upon its stock. A dividend is a division of the net profits of the bank among the stockholders in proportion to the amount of stock each holds and is designated as a percentage of the capital. Thus, if a bank pays 10 per cent. dividends, it divides each year among the stockholders an amount of money equal to 10 per cent. of its capital stock. The par or face value of the stock of national or state banks is $100. Its real value is what it sells for. The stock of some banks is worth many times its par or face value.

The first chartered bank in this country was the Bank of North America. The charter was granted by the Congress of the Confederation in 1780. Because there was some doubt as to the power of Congress to do this, the bank was rechartered by Pennsylvania in 1781. In 1784 the Bank of Massachusetts and the Bank of New York were organized. In 1791 Congress established the Bank of the United States; the charter was limited to 20 years. The capital was $10,000,000 one fifth of which was supplied by the government. The headquarters of the bank was in Philadelphia, with branches in other cities of the country. When the charter expired in 1811, Congress refused to renew it. In 1816 the second United States Bank was chartered by the government with a capital of $35,000,000 of which the government subscribed one fifth. This bank was used as a depository for government funds, and five of its 25 directors were appointed by the government. In 1832 Congress passed an act renewing its charter, but President

Jackson vetoed it. The bank became a great political issue, and President Jackson ordered the public funds to be removed from the bank and deposited in state banks. In 1836 the bank's charter expired, but a few days before this occurred Pennsylvania gave it a state charter and it became the United States Bank of Pennsylvania. Between 1836 and 1863 only state banks existed in the United States.

The several state banking-systems, no two alike, caused great dissatisfaction and losses. Each state had its own banking laws and under them the state banks issued currency. The laws were so loosely drawn that suspensions and failures were frequent. In many instances the privilege of issuing notes to circulate as currency was grossly abused. This led Secretary Chase in 1861 to suggest a national-bank act, and in 1863 such an act was passed by Congress and became the basis of the present national banking laws. Congress in 1865 levied a tax of 10 per cent. on all circulating notes other than those issued by national banks, and this prohibitive tax put an end to state-bank currency.

National banks can issue their own bank-notes to circulate as currency by depositing United States bonds with the Comptroller of the Currency. The bank can issue notes to an amount equal to the bonds so deposited but not to exceed the amount of the bank's capital stock. Thus a national bank, having a capital of $1,000,000, can issue $1,000,000 national bank-notes, provided it deposits $1,000,000 United States bonds.

Any five citizens of the United States can organize a national bank. In towns or cities of less than 3,000 population a national bank with but $25,000 capital can be organized; where the population is between 3,000 and 6,000 the capital stock must be at least $50,000; between 6,000 and 50,000 population the capital stock must be at least $100,000 and over 50,000 population the capital stock must be at least $200,000.

In May of 1908 Congress enacted what is known as the Emergency-Currency Law. Under the provisions of this law ten or more national banks, each having an unimpaired capital and surplus of not less than 20 per cent. of its capital stock, all of the banks having a total capital and surplus of at least $5,000,000 were allowed to form a National Currency Association for the purpose of providing for an issue of emergency currency in times of financial stress or panics. Any bank belonging to a National Currency Association could use stocks, bonds or commercial paper (the notes of commercial houses) which had been approved by the association as a basis for additional circulation. To secure this emergency currency from the government through the currency association, the bank must meet certain requirements and do certain things laid down in the emergency currency law but always under the direction and control of the Secretary of the Treasury.

The law also provided for the issuance of emergency circulation to the banks direct without compelling the bank to secure such circulation through the medium of a currency association. A special tax on emergency circulation was provided for; it amounted to five per cent. a year for the first month such circulation was outstanding and one per cent. a year for each additional month until the tax reached 10 per cent. a year. This tax was levied to make it unprofitable for a bank to issue emergency circulation, the idea being that such circulation should only be used when the emergency was so great as to imperil the banks. The law also carried a provision for a currency commission of eighteen members, the Speaker of the national House of Representatives to name nine and the presiding officer of the United States Senate to name nine. This commission also inquired into the entire subject relating to currency and made a report to Congress. The emergency currency law expired by limitation on June 30, 1914.

France claims the credit of being the mother of savings banks, basing this claim on a savings bank said to have been established in 1765 in the town of Brumuth, but it is of record that the savings bank idea was suggested in England as early as 1697. There was a savings bank in Hamburg, Germany, in 1778 and in Berne, Switzerland, in 1787. The first English savings bank was established in 1799, and postal savings banks were started in England in 1861.

The first chartered savings bank in the United States was the Boston Provident Savings Institution, incorporated December 13, 1816. The Philadelphia Savings Fund Society began business the same year, but was not incorporated until 1819. In 1818 banks for savings were incorporated in Baltimore and Salem, and in 1819 in New York, Hartford, Newport and Providence.

Savings banks are organized and maintained for the conveniences of the person of small means who by making small deposits can in time accumulate a comfortable sum of money. Such banks differ widely in the conduct of their business from commercial banks. Deposits in commercial banks are subject to withdrawal without notice, but savings banks reserve the right to require from 30 to 60 days—and in some instances six months'—notice of withdrawal of funds. Interest ranging from three to five per cent. *per annum* is paid on savings deposits, but such deposits must remain in the bank for a certain period—the time varying according to the rules of the banks—before interest is allowed.

If the funds are withdrawn before interest time, the depositor loses the interest.

The postoffice savings banks which were established in England in 1861 at first were tried at only a few postoffices, but later the system was extended to include all the money-order offices in the United Kingdom.

In the United States the Postal Savings System was inaugurated under act of congress in 1911. On June 30th, 1912, the number of depositors was 8,113, and the deposits were approximately $20,300,000.

Deposits bear interest at two per cent per annum, principal and interest being guaranteed by the United States Government. Accounts may be opened and deposits made by any person of the age of 10 years or over. Deposits are received from individuals only, and not from corporations, associations or firms. Receipts for deposits are given in the form of postal savings certificates which are issued in denominations of $1, $2, $5, $10, $20, $50, and $100 each. No person is permitted to deposit more than $100 in any one month, nor have more than $500 on deposit at one time. A depositor is permitted to exchange his deposits for sums of $20, $40, $60, $80, $100 or multiples of $100 up to $500 into United States bonds bearing interest at 2½ per cent per annum, payable semi-annually. Full information concerning the Postal Savings System may be obtained at any depository office or by addressing the Postmaster General (Postal Savings System), Washington, D. C.

A trust company is a banking institution organized under the laws of a state. In some states trust companies are not permitted to exercise all the functions of a bank; in other states banks are permitted to perform the functions of a trust company in addition to general banking. Trust companies act as trustees, guardians, administrators and executors of estates, conservators, agents, etc. In short, they can act in all matters of trust as if they were human individuals. A trust company can be appointed guardian by a court for orphan children. It can manage the estate of a dead person. It can be appointed to take care of an insane person or to manage the affairs of a spendthrift. Its varied and many functions bring it into close personal relationship with its clients. It also acts as trustee for railroads and other corporations issuing bonds, and does many things which banks cannot do. Many trust companies have savings departments, and, besides, do a large real estate business.

One of the most important services rendered by a bank is the transmission of funds or credit from one part of the country to another. For instance, a debtor in New York who wants to pay his creditor in Chicago, pays the money to a New York bank which, for a small charge, gives him a draft on a Chicago bank. This he sends to his Chicago creditor, who presents it to the bank in Chicago and receives the money. No money is sent by the banks in New York to Chicago, because Chicago banks send drafts to New York, and an account of how they stand toward each other is all that is necessary, and in this way the sending of money from one place to another is avoided. In the same way, one bank in a large city is constantly paying out money in exchange for checks and drafts which strictly should be paid by another bank. But instead of the first bank making the second bank at once pay back the same amount, all the banks of the city meet together once or twice a day, each showing how much it has paid out for the others, and how much they have paid for it, and the difference only is paid in cash. This is called a clearing-house. The first clearing-house originated in London. Many cities in the United States now have them.

Following are the number of banks, with their capital, surplus, deposits, etc. in the United States, as shown in the report of the comptroller of the currency for 1911:

*National Banks.* Number, 7,301, capital stock paid in, $1,025,441,384; surplus, $670,041,576; United States bonds to secure circulation, $707,204,380; national bank notes outstanding, $696,982,033; deposits, $5,489,995,011.

*State Banks.* Number, 17,115, divided into following: commercial banks, 12,864; capital, $452,944,684; surplus, $170,566,937; deposits, $2,777,566,835; loan and trust companies, 1,251; capital, $385,782,993; surplus, $400,406,067; deposits, $3,295,855,895; mutual and stock savings banks, capital, $72,177,899; surplus, $261,834,082; deposits, $4,212,583,598; savings depositors, 9,794,647, having an average deposit of $430.09.

There are also 1,116 private banks, having a capital of $21,872,416, surplus $7,329,974 and deposits, $142,277,224.

MALCOLM MCDOWELL.

**Bankrupt** is a term applied to a person who is unable to pay his debts, and bankruptcy laws are laws which prescribe the methods by which the estate of an insolvent debtor is applied in payment of his debts and the debtor himself is relieved from further obligation.

**Bankruptcy** may be voluntary or involuntary. Voluntary bankruptcy occurs when a debtor asks to be declared a bankrupt, involuntary bankruptcy when his creditors ask it. In the United States Congress legislates as to bankruptcy, though the states may do so, but a federal statute suspends a state law covering the same ground. Congress has four times passed a national bankruptcy law, that of 1898 being the latest. Proceedings begin by a debtor committing an act of bankruptcy, either by becoming unable to pay or by attempting dishonestly to alienate his property. Then a petition

is filed, and the court orders the property to be put under the control of a receiver. The debtor states his affairs on oath and is publicly examined, and the creditors meet. He may offer to compound with them, that is, to pay part of what he owes. If his creditors approve, the court or receiver may allow the arrangement. If he does not offer to pay, the court says he is a bankrupt and the creditors appoint a trustee. He administers the estate and controls the bankrupt's movements. The latter can at any time after being declared a bankrupt ask to be discharged, but this may be refused, suspended or granted conditionally. When the trustee has divided the debtor's property among his creditors in proportion to the amount he owed each, he is released from his debts and discharged from bankruptcy.

The ancient Roman law against bankruptcy regarded it as a crime, so that the creditors might sell the debtor into slavery or divide his body into pieces. An English act of 1622, again, condemned a debtor who failed to show just reason for being unable to pay his debts to have one ear nailed to the pillory and afterwards cut off. The mildness of recent laws against bankruptcy is not only due to a more humane spirit, but also to the great complexity of modern business, which may cause a man to become bankrupt to a greater degree than formerly through no fault of his own.

**Banks, Nathaniel Prentiss,** an American general, born in 1816 at Waltham, Massachusetts. He studied law and was elected to the state legislature, being made speaker of the house in 1851. He was elected to Congress in 1852, but being opposed to slavery left the Democratic party. In 1854 he was again sent to congress by the Republicans and Know-nothings, and was chosen speaker of the house in 1856. He was governor of Massachusetts from 1857 to 1860. Soon after the outbreak of the war he was given command of an army corps on the Potomac. In 1862 he succeeded General Butler in the command of the Department of the Gulf. In 1863 he captured Port Hudson with 6,000 prisoners, which effected the opening of the Mississippi River, and in 1864, with Admiral Porter in charge of a gunboat fleet, he led an unsuccessful expedition up the Red River, and was there relieved of his command in May, 1864. He was a member of Congress from 1864 to 1870 and again from 1874 to 1876, and was re-elected in 1888. He died Sept. 1, 1894.

**Banks of Newfoundland, The,** extending for a length of some six hundred miles, are famous for their cod fisheries. Other fish are also abundant on the Banks; and it may be said that Newfoundland depends almost entirely upon its cod, seal and herring industries. The Banks are believed to have been gradually formed through the melting of icebergs, which here come into contact with the warm waters of the Gulf Stream and deposit the earth and stones which they may have carried from Arctic shores.

**Ban'nockburn,** a Scottish village on the stream of that name. It is noted for the great battle fought there in 1314 between the English under Edward II, with 100,000 men, and the Scotch under Robert Bruce, with 30,000, in which the English were completely defeated, losing nearly 30,000 men. The stone on which Bruce is said to have fastened his standard is still to be seen, and near it a flagstaff, 120 feet high, was erected as a memorial.

**Ban'yan** or **Banian,** a tree of India and tropical Africa, remarkable for the great branches which it sends down to the earth, and which take root again, forming new trunks. In this way the tree spreads over a great surface and lasts for many ages, though the original trunk may decay. One has been described as having 350 trunks as large as oak trees and more than 3,000 smaller ones. It grows from seventy to a hundred feet high. Alexander Campbell is said to have once sheltered 7,000 men under a banyan. Great numbers of birds and monkeys live in the tree and eat its fruit,—a kind of fig. The Brahmans hold the tree in great reverence.

**Barba'dos,** the most eastern of the West Indian Islands, to the eastward of the Windward Islands. It is twenty-one miles long and fourteen and one-half miles broad. It contains 166 square miles, or 106,470 acres, of which about 100,000 are cultivated. The island is almost surrounded by coral reefs. The highest point of land is Mount Hillaby, which is 1,104 feet above the sea. The climate is very healthy, but the people are in constant danger from hurricanes, which destroy an immense amount of property and many lives. One storm, in 1780, killed 4,326 persons and swept away about $6,000,000 worth of property. Since the suppression of slavery in the island in 1834, its prosperity has greatly increased. The population is 199,542, a large part of which is colored. England first settled the island in 1625, and it still belongs to her. The capital is Bridgetown (population, 33,000).

**Barbarossa.** See FREDERICK I.

**Barbaros'sa** (meaning Red Beard), three brothers, natives of Greece, who, as Turkish pirates, were the terror of the Mediterranean Sea during the first half of the 16th century. One of them murdered the chief men in Algiers and seized the town, but was captured in 1518 and beheaded. His younger brother took his place in Algiers, and, putting himself under the protection of Turkey, conquered Tunis for her. He defeated the Christian nations several times in sea-fights, and helped the French to take Nice in 1543. With thousands of captives he returned in

triumph to Constantinople, where he died in 1546.

**Bar'bary States,** a large region in northern Africa, comprising modern Barca, Tripoli Proper, Fezzan, Tunis, Algeria and Morocco. In ancient times the countries included in it were called Mauritania, Numidia, Africa Proper and Cyrenaica. It is divided by the Atlas Mountains, and stretches from Egypt to the Atlantic Ocean and from the Mediterranean Sea to the Desert of Sahara. The whole or parts of it have been conquered at different times by the Romans, Vandals, Arabs, Turks and French. Excepting the French and other Europeans, the inhabitants are mostly Mohammedans.

**Barca,** known also as **Benghazi,** a Turkish vilayet in Tripoli-in-Barbary, projecting into the Mediterranean, opposite Greece and the island of Crete, and having to the south of it the Libyan Desert. It is flanked on the east by Egypt and the mouth of the Nile River, and on the west by Tripoli, the Gulf of Sidra and Algeria. In early days the region was the Dorian colony of Cyrene, subsequently captured and pillaged by the Persians. Later on it became a province of Greece, but, declaring itself independent, it was invaded and conquered in A. D. 641 by the Arabs. With Tripoli it fell under Turkish dominion, and in 1835 the entire region was proclaimed a Turkish vilayet; though, forty years subsequently it was placed under a separate administration directly responsible to the Porte. The country is in the main arid and sandy, with a few elevations, together with fringes of arable and pasture land, where barley and wheat are grown, cattle and sheep are bred, and fruits, including dates, olives, oranges and lemons, are grown. Sponges also are among its exports, besides goat-skins, ostrich-feathers, ivory and the produce brought by caravans from the Libyan Desert and the Sudan. Arabic is the tongue commonly spoken in the district, though the official language is Turkish. The population of Barca or Benghazi is 320,000 to 520,000, mostly Berber, though Jews are numerous.

**Barcelo'na,** the most important manufacturing city in Spain, and next to Madrid in size, is situated on the Mediterranean Sea. It is divided into the old and new towns by a beautiful promenade called *La Ramble.* It has a Gothic cathedral 600 years old, a university, public libraries, museums and theaters. It is the most important port of Spain except Cadiz. Silk, lace, woolen and cotton goods, shoes and firearms are its principal manufactures. It is a very old place, supposed to have been founded 400 years before the Romans, and rebuilt by Hamilcar Barca, the father of the great Carthaginian general, Hannibal. In 878 it became an independent city under the counts of Barcelona, but was joined to the kingdom of Aragon in the 12th century. During the middle ages it was a flourishing seaport. Ferdinand and Isabella received Columbus here, in 1493, after his discovery of America. In 1714 it was captured by the Duke of Berwick for the French after a long siege, and the town pillaged. Napoleon got possession of it in 1804, and it was held by the French till the Treaty of Paris in 1814. Barcelona is also a province of Spain, area, 2,968 square miles, population, 1,133,883. The city's population is 560,000.

**Barebone's Parliament,** a name applied in derision to an assembly of Roundheads summoned by Cromwell in 1653 to govern the then Puritan England after turning out the "Rump" of the Long Parliament. It was composed of about 140 members, and received from the Cavaliers its nickname of Barebone's Parliament from the name of an officious member, Praise-God Barebone, a leather merchant of Fleet Street, London. The assembly, though composed in part of many responsible and capable as well as godly men, proved rather unmanageable, and as it began to originate laws of a more or less radical order, which the Lord-Protector deemed beyond the legitimate province of the assembly, Cromwell ordered its dissolution after many of the body had personally surrendered their vested power into his hands. The Parliament lasted from July 4th to Dec. 12th, 1653, and in spite of its wittily applied name it enacted several wise measures of reform. Before resigning as a body, it named a new Council of State, and this council proceeded to draft a constitution, historically known as the Instrument of Government. Under this instrument Cromwell was made Lord-Protector of the commonwealth, and was given a council of twenty-one members, by whose advice he was to be guided in foreign and domestic affairs.

**Bar Harbor,** a famous summer resort, is situated on Mt. Desert Island off the coast of Maine. This island, the largest on the New England coast, was discovered by Champlain who named it *L'Isle des Monts Deserts* or the isle of the desert mountains. In its area of 100 square miles there are fifteen mountains from 700 to 1,500 feet above the sea level, and as many beautiful lakes from a few acres to several square miles in area.

Bar Harbor has a permanent population of 5,000. In the summer this is increased to 12,000 or more. It contains several large hotels but is becoming more each year a city of magnificent summer residences which are popularly known as cottages. These are occupied during the summer by members of some of the wealthiest and best known families of the large cities. In addition to its natural attractions of mountain, lake and shore, Bar Harbor has many public improvements including fine roads, bridle paths, excellent drainage, an abundance of

pure water, electric lights and unusual railroad, postal, telephone and telegraph facilities.

**Bark,** the portion of the stems of trees and shrubs outside the wood. Sometimes extended by analogy to the cortex of herbs, especially of such as the flax, hemp, etc., which contains textile fibers. In spring, this part is usually easily separable from the wood, because young cells which are easily ruptured are forming at the juncture of the two. (See CAMBIUM.) In Europe (and consequently in English translations of German books), the term bark is applied only to the dead and dry outer portions of what Americans call bark. The bark of a young twig shows three parts: the outer, corky layer, composed mainly of a dead tissue, cork; the green layer of living cells capable of food-making; the inner (often fibrous) layer concerned in the transport of foods. (See BAST.) As the bark grows older it undergoes various modifications: (1) The outer part either becomes thick and ridgy, or is sloughed off in flakes or strings. (2) The green color disappears from the middle layer or this layer also may be sloughed off; leaving (3) the inner portion alone, which, being added to yearly, consists of partly dead and partly living tissues in various proportions in different plants. Many barks are of great economic importance on account of the tannins, alkaloids, aromatic substances, etc., which they contain. The bark of several oaks and of hemlock is used in tanning leather; Peruvian bark yields quinine and other alkaloids, used as medicine; stick cinnamon is the rolled inner bark used as a spice.

**Barker, Lewellyn Franklin,** a native of Ontario, graduated in medicine in Toronto University in 1890. Up to 1893 assistant resident physician at Johns Hopkins Hospital, associate professor of anatomy and later of pathology in Johns Hopkins University. A member of the Johns Hopkins commission for the study of tropical diseases in the Philippine Islands in 1899. In 1900 made professor of anatomy and director of the anatomical laboratories of the University of Chicago. In 1901 he was a member of the United States government commission for the investigation of the plague in San Francisco. A double gold medalist of Toronto University. Has spent much time studying at Leipsic, Berlin, Munich and London. In 1905 appointed a professor of Johns Hopkins Hospital and School of Medicine as successor to Dr. Wm. Osler.

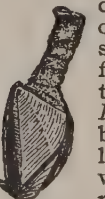
**Bar'ley,** a well-known grain produced by a species of the genus *Hordeum*, which belongs to the grass family. The ordinary barley is the *H. sativum*. In its cultivated form it is unknown in nature, but is commonly supposed to have originated from a wild species which is now growing from Asia Minor and the Caucasus to Persia and Baluchistan. All the cultivated forms are probably derived from this one stock.

**Barmecide's Feast,** an imaginary banquet, from the story, in *Arabian Nights*, of one of the Barmecide family who put a number of empty dishes before a starving beggar, giving them fine names as he did so. The beggar humored the joke, pretending to eat heartily, and at last feigned to be so intoxicated with the imaginary wine that he boxed the ears of his host. The host was so pleased with the beggar's patient humor, that he set a real dinner before him at once.

**Bar'men,** a busy city in Rhenish Prussia. Nowhere else in Germany are so many factories found in one place. It has the largest factories for ribbon-weaving on the continent, and also manufactures lace, thread, buttons, braid, cotton cloth, silk goods, steel wares and plated goods. It is made up of a number of villages, which form almost one continuous street six miles long. Population, 169,201.

**Bar'nabas,** one of the early Jewish Christians, best known for his connection with the Apostle Paul, was born at Cyprus. His name was Joses, Barnabas being a surname which means son of exhortation. He was sent to Antioch to learn the truth of the story which had reached Jerusalem of the conversion of Paul, and was with him there a year, helping him in his work. They were sent together on a mission to Cyprus and Asia Minor. The people of Lystra, on this mission, called him Jupiter, and Paul, Mercury, from which it is thought Barnabas must have been large and fine looking. Nothing further is known certainly about him, though some scholars think he wrote *Hebrews*. The Gospel of St. Barnabas in Arabic is not considered his writing. The Roman Catholic church observes the 11th of June as St. Barnabas's day.

**Barnacle.** Among the most common objects at the sea-coast are the acorn-shells, attached to rocks, and other forms of barnacles attached to the piles supporting wharves and other submerged objects. These animals possess a shell, but are not related to the clams, oysters and sea-snails; on the other hand, they are closely related to the crabs, shrimps and lobsters. In one of the common forms, the shelled animal is perched on a flexible stalk (see Fig.). This is the common ship-barnacle or *Lepas*, frequently attached to the bottom of ships. Feathery-like limbs protrude from the shell, which, by moving, produce currents in the water that bring food to the animal.


BARNACLE

(*Lepas anatifera*) These animals have a strange life-history. The females lay eggs, but the young, when hatched, do not look like the parents;

they are free swimming and higher developed, and show their resemblance to the other crustacea (crabs, lobsters, etc.). After swimming freely for a time, these young forms settle down and grow firmly attached to some object in the water. Then they undergo changes that carry them downward instead of upward in the scale of life; therefore, the adults are not on as high a plane as the young. The forms growing to the rocks have no stalks. A myth of the middle ages led to the strange belief that a kind of goose-barnacle gave birth to goslins.

**Barnard College** is the institution which cares for the undergraduate women students of Columbia University. It is named in honor of President Frederick A. P. Barnard, former president of Columbia University, to whose recommendations and efforts this college owes its existence. In 1883 the trustees of Columbia College authorized the bestowal of "suitable academic honors and distinctions" upon women who had pursued successfully courses of study outside of Columbia College, but under the observation of its authorities. Women students began at once to take advantage of this privilege, and from that beginning the present college has grown. The college buildings are beautifully situated at 120th Street, Morningside Heights, New York City. It takes very high rank among institutions of advanced learning for women.

**Barnard, Frederick A. P.,** American educator and scientist, was born in Massachusetts in 1809, and died in New York city, April 27, 1889. Educated at Yale, he occupied for a time the mathematical chair at the University of Alabama, and later on was successively president of the University of Mississippi and of Columbia College, New York. In the latter post he did admirable work, and at his death his estate was devised to it. In his honor Barnard College for women was founded as an annex to Columbia. In 1867 President Barnard represented the United States as commissioner to the Paris exposition; he was also president of the American Association for the Advancement of Science. Besides a number of works of an educational character, President Barnard published treatises on *The Metric System*, on the *Undulatory Theory of Light* and a *History of the United States Coast Survey*.

**Barneveldt** (*bär'nē-vĕlt*), **John Van Olden,** grand pensionary of Holland, who held an important place in the long struggle against Spain, was born in the province of Utrecht in 1547. In 1585 he was sent on an embassy to Queen Elizabeth of England, and on his return was made advocate-general of Holland. He became the head of the republican party, and opposed the warlike tendencies of Prince Maurice, who then was stadtholder. In 1609 he secured peace with Spain. He was in favor of the more tolerant of the two parties in Holland, called the Remonstrants or Arminians, while Maurice sided with the other, called the Gomarites. Barneveldt tried to bring about an agreement between them in religious matters, but his enemies claimed that he was acting secretly in the interest of Spain. In 1618 he was illegally tried and convicted of treason, though his country really owed its political existence to him. He was beheaded at The Hague in May, 1619. His story is well known to American readers through the *Life and Death of John of Barneveldt*, written by the historian Motley.

**Bar'ney, Joshua,** an American commodore, was born at Baltimore, Maryland, in 1759. After distinguishing himself in several engagements and being imprisoned in England, he was appointed captain of the famous ship *Hyder Ali*. In 1782 he captured the British ship *General Monk*, for which he received the rank of commodore. After the Revolution he was for a time in the French navy. In the War of 1812 he commanded a fleet of gunboats, and also distinguished himself at the defense of Washington. He died at Pittsburg, Pa., in 1818.

**Barnum, Phineas Taylor,** American showman, was born at Bethel, Connecticut, July 5, 1810. He began business at thirteen years of age as clerk in a country store, then was in the lottery business, and afterward edited a newspaper in Danbury, Conn., where he was imprisoned sixty days for libel. In 1834 he bought in New York a colored woman, said to have been the nurse of Washington, and exhibited her as Washington's nurse. In 1841 he got hold of Scudder's museum in New York, which soon became famous. Here he exhibited the famous dwarf, General Tom Thumb, whom he afterward showed through Europe. In 1849 he induced Jenny Lind to sing in New York and other cities at $1,000 a night for 150 nights. The tour was successful, Barnum receiving $700,000 from the sale of tickets at auction. In 1871 he organized a museum, menagerie and circus, which took 500 men and horses to carry it through the country. This he enlarged in later years until it required a hundred railroad cars to transport it. In 1879 he said that 90,000,000 people had visited his show, and the number enormously increased in later years. Mr. Barnum was well known as a benevolent

PHINEAS T. BARNUM

man and also as author of several books—an *Autobiography* (1854), *The Humbugs of the World* (1865), *Struggles and Triumphs* (1869) and *Money-getting* (1883). He died at Bridgeport, Connecticut, April 7, 1891.

**Baro'da,** a city of Hindostan. It is 250 miles north of Bombay, with which it is connected by railroad. It is the residence of the Gaikwar, a Mahratta prince. It has several Hindu palaces and temples and the court of the state to which it belongs. Its trade is considerable. Baroda is also one of the feudatory or native states in British India (area 8,099 square miles, with a population of 1,972,600). Population of the city, 103,790.

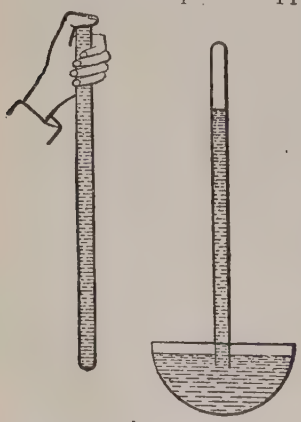
**Barom'eter,** an instrument for measuring the pressure exerted by the earth's atmosphere. It consists simply of a U-tube, one end of which opens into the earth's atmosphere, the other into a vacuum, the intermediate portion of the tube being filled with a liquid, usually mercury.

To clearly understand the barometer, we must recall that at the beginning of the 17th century the two following facts were supposed to be entirely independent, namely, (1) the fact that "nature abhors a vacuum" and (2) the fact that the air has weight. It was Torricelli (born in 1608, died in 1647), who first showed that "nature abhors a vacuum *because* the air has weight."

(1) MERCURIAL BAROMETER.

He illustrated this by taking a tube. more than 76 centimeters long and closed at one end, which he filled with mercury, as indicated in the figure. Placing his finger over the open end, he inverted the tube in a dish of mercury. The column of mercury fell a short distance, but remained standing in the tube approximately at the height of 76 centimeters above the surface of the mercury in the dish.

Torricelli thus showed that the weight of the earth's atmosphere is approximately that of an ocean of mercury covering the entire earth to the depth of 76 centimeters. But if this be the fact of the case, Torricelli argued that the height of the mercury in the inverted tube should diminish as one ascends in the earth's atmosphere. This test was shortly made by Pascal, who carried the inverted tube to the top of a mountain in France, and found that the mercury fell some seven or eight centimeters in the ascent. Such a dish of mercury and inverted tube is called a *mercurial barometer*. The vertical distance between the two surfaces of mercury, one in the tube, the other in the dish, is called the *height of the barometer* or, sometimes, the *reading of the barometer*. Ordinary barometers are furnished with graduated scales by which this height can be easily read.



TORRICELLI'S EXPERIMENT

In general the height of a barometer depends upon two factors: (1) the height of the atmosphere and (2) the average density of the atmosphere. Anything which changes either one of these will change the reading of the barometer.

Water vapor, when under the same pressure as air, has a density which is less than that of air. If then there be much water vapor in any portion of the earth's atmosphere, its density will be diminished and the mercury column which it supports will become shorter. The barometer is said to fall. But the same thing happens when the *height* of the atmosphere is changed or when its pressure is altered by cyclonic motion. The barometer is *not*, therefore, an instrument for telling whether or not it is about to rain; but for measuring the pressure of the earth's atmosphere. The readings of the barometer are, however, exceedingly useful, *as one factor*, in predicting the weather.

(2) ANEROID BAROMETER.

Since the mercurial barometer is not easily portable, geologists and travelers generally use a smaller form based upon the same principle as the ordinary steam gauge. It consists essentially of a hollow cylinder made of thin sheet-metal and bent into a circular form. After the air has been partially removed from this cylinder it is hermetically sealed. As the pressure of the air outside diminishes, the metallic vessel tends to uncoil from the circular into a straight form. By a system of levers this motion is communicated to an index moving over a dial from which the barometric height can be read. Such an instrument is called an *aneroid barometer*. This is not nearly so reliable as the mercurial barometer; but when it is used with care and frequently compared with a mercurial barometer, it is exceedingly convenient for measuring altitudes. Hough, Hipp and others have invented excellent self-registering barometers.

Boudin of Paris makes a delicate thermometer which by changes of boiling-point of water will indicate differences of altitude as small as 30 feet. Such an instrument is equivalent to a barometer and is called a *hypsometer*.

**Barr, Amelia Edith** (Huddleston), Anglo-American novelist, was born at Ulverston, Lancashire, England, March 29, 1831, and was educated at the High School at

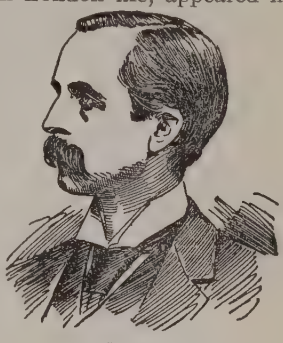
Glasgow, Scotland. In 1850 she married Wm. Barr, and four years later they came to this country and settled in Texas, where the husband and three children died of yellow fever at Galveston in 1867. With her three remaining children (daughters), Mrs. Barr removed to New York, where she began to write for the religious periodicals and to publish a series of semi-historical tales and novels. The more popular of the latter are *A Bow of Orange Ribbon*, *Jan Vedder's Wife*, *A Daughter of Fife*, *Friend Olivia*, *Beads of Tasmer*, *Sister to Esau*, *A Rose of a Hundred Leaves*, *The Lone House* and *Prisoners of Conscience*. She has also written *Romance and Reality*, *The Hallam Succession*, *Young People of Shakespeare's Time*, *A Border Shepherdess*, *Bernicia*, *Feet of Clay*, *Remember the Alamo* and a number of other stories.

AMELIA E. BARR

**Barre, Vt.,** a city in Washington County, six miles from Montpelier. It is one of the most important granite centers in this country. The city has a school for young men and women, the Spaulding High School, Goddard Seminary, a public library, opera house, banks, newspapers, etc. It has the service of three railroads. Population, 10,734.

**Barras** (*bà'rà'*), **Paul François Jean Nicolas, Comte de,** a prominent man in the French Revolution, was born in June, 1755. He served in his youth as a soldier in India against the English, leaving the army with the rank of captain. His dissipation soon made away with his fortune, and he joined the Revolution in the hope of regaining it. He became a member of the states-general in 1789, of the national convention in 1792, and was an active opponent of the royalist party, voting for the execution of the king. He conducted the siege of Toulon, where he first met Napoleon, and put down with great cruelty a revolt in the south of France. He was active in overthrowing Robespierre in 1794. In 1795 he was appointed general-in-chief, and by calling Napoleon Bonaparte to his aid put down the rebellion which was just starting. About the middle of 1794 he became dictator, but his love of pleasure made him unpopular, and he had to yield to Napoleon in 1799. His later years, until his death in 1829, were spent in conspiracies against the government.

**Barrie, Sir James,** greatest of modern Scotch novelists, made a baronet in 1913, was born at Kirriemuir ("Thrums"), a little Forfar weaving town, May 9, 1860, and educated at Dumfries Academy and at the University of Edinburgh. He began his literary career as a leader-writer on a newspaper in Nottingham, England, then became a journalist in London, contributing under the pen name of Gavin Ogilvy to the *British Weekly*, the *Speaker* and the *National Observer*. His first book, *Better Dead*, a satire on London life, appeared in 1877, and was followed by two more important and far more successful works, *Auld Licht Idylls* and *When a Man's Single*. These were followed by *A Window in Thrums* (1889), which won fame for the novelist; after which appeared *An Edinburgh Eleven*, *My Lady Nicotine*, *Sentimental Tommy* and a memoir of his mother, *Margaret Ogilvy*. His first long story now appeared, *The Little Minister*, in which he shows himself the literary artist. In 1892 appeared a comedy, *Walker London*, which enjoyed a phenomenal run. Tender sympathy and shrewd humor, mark his style. His later works, beside a dramatic version of *The Little Minister*, also very successful on the stage, are *The Professor's Love Story*, *Tommy and Grizel*, *Peter Pan* and *Alice-sit-by-the-fire*.



JAMES M. BARRIE

**Barrie,** county seat of Simcoe County, Ont., is a pleasant city of 6,575 inhabitants, situated 839 feet above the sea on the north side of Kempenfeldt Bay (Lake Simcoe). The Grand Trunk Railway runs through it, and here starts the Lake Simcoe steamer, traversing a beautiful body of water 30 miles long and 26 wide. In the vicinity was fought that war in which the Iroquois Indians completely destroyed the power of the Hurons. The summer temperature makes the spot a favorite resort.

**Barrows, John Henry,** president of Oberlin College, Ohio, and a minister of the Presbyterian church, was born at Medina, Mich., in 1847, and in 1867 graduated from Olivet College, Mich. He subsequently studied at Yale, Union and Andover theological seminaries, and from 1881 to 1895 was pastor of the First Presbyterian Church, Chicago. During the Columbian exposition (1893) held in that city, he was chairman of the general committee on religious congresses. In 1896 he resigned his pastoral charge in Chicago and proceeded to India, to lecture on religious subjects under the auspices of

the Haskell endowment of the University of Chicago. On his return he became lecturer at the latter on Comparative Religions, and was also lecturer at Union Theological Seminary, New York. He is the author of a *History of the Parliament of Religions;* a *Life of Henry Ward Beecher;* *Christianity, the World Religion;* and *The World Pilgrimage.* Died June 3, 1902. His daughter has since published a biography of him.

**Barry, John** (1745–1803), an officer of the United States Navy, the first senior officer of the service to have the rank of commodore conferred upon him after the reorganization of the American Navy in 1794. Born in Wexford County, Ireland, he early began to follow the sea as a profession, first as master of a trading ship and subsequently, after coming to America and settling in Philadelphia, as an officer of the United States Navy. In the Revolutionary War he was given command of the *Lexington,* in which he made some captures of English vessels; while after being transferred to the command of the frigate *Effingham* he captured an English war schooner in the Delaware River, and in the winter of 1776–77 he assisted at the battle of Trenton. In 1787 he commanded the *Raleigh,* which was pursued by the British and driven ashore; he later on commanded the *Alliance* and in a sharp engagement he captured the *Atlanta* and the *Trepassy* and gained well-earned promotion.

**Barry, William Farquhar,** an American major-general and artillery officer, was born in New York city in 1818, and died near Baltimore, Md., July 18, 1879. After service in the Indian War in Florida, in the Mexican War and on the western frontier, he became chief of artillery of the Army of the Potomac in the Civil War. In 1864 he gained promotion for gallantry at the fall of Atlanta and also for distinguished service in the campaign against General J. E. Johnston. Later on he was given command of the artillery in the armies under General Sherman, and had charge of the defenses of Washington. He for a time also was in command of the artillery school at Fortress Monroe. He was one of the authors of the *Engineer and Artillery Operations of the Army of the Potomac* and of *A System of Tactics for the Field Artillery of the United States.*

**Barth** (*bärt*), **Heinrich,** a distinguished German traveler, was born at Hamburg in 1821. After visiting Italy and Sicily, he crossed the Mediterranean in 1845 to Tangier in Africa, and made short trips into the interior, to Tunis, Tripoli and Benghazi and then down the Nile. Soon after he extended his travels into Egypt, Palestine, Asia Minor and Greece. He published an account of his travels, called *Wanderings Along the Shores of the Mediterranean.* In 1849, with Dr. Overweg, he proceeded on an exploring journey through Central Africa. He was gone nearly six years, traveling about 12,000 miles. He published his *Travels and Discoveries in Central Africa* and a work on the *Vocabularies of Central Africa.* After other journeys in Greece, Turkey and Asia Minor, he died at Berlin, Nov. 25, 1865.

**Bartholdi** (*bär'tôl'dē'*), **Frederic Auguste,** a sculptor, was born in Alsace in 1834. He has made a number of famous statues. Among them are the *Lafayette* statue in New York; *Vercingetorix,* the leader of the Gauls, which is now in the galleries of the French government; *The Lion of Belfort* and *Grief.* It occurred to him in 1874 that it would be a fitting thing for France to present to America a statue in honor of American independence. The result of this idea is the gigantic bronze statue of *Liberty Enlightening the World,* which was finished in 1884, and, after two years spent in getting it into position, was unveiled on Bedloe's Island in New York harbor. Bartholdi received the cross of the Legion of Honor in 1887. He died Oct. 4, 1904.

**Bartholomew Fair,** held at West Smithfield, London from 1133 to 1855, its charter having been granted by Henry I to a monk. It was held yearly at the Festival of Bartholomew. In the begininng it was one of the great yearly markets of the nation, more cloth being sold there than anywhere else in the kingdom. All sorts of amusements were used to attract people to it; all kinds of shows, acrobats, stilt-walkers, mummers and merry-andrews were to be found there in great numbers. After 1685 the famous fair began to lose its trade, and came to an end in 1855.

**Bartholomew, Massacre of St.,** the name given to the massacre of the Huguenots in Paris on the night of St. Bartholomew's Day, Aug. 24, 1572. During the youth of Charles IX his mother, Catherine de Medici, acted as regent and showed an extraordinary cruelty. Pretending friendship to the Huguenots, she married her daughter Margaret to Prince Henry of Navarre, afterward Henry IV, the head of the Huguenot party, and appointed Admiral Coligni, another leader of the Huguenots, to a high office in the kingdom. Having induced all the chief members of the party to come to Paris, she secretly appointed St. Bartholomew's Day as the day for their massacre. Admiral Coligni was murdered in the palace, and the bell of the palace was rung as a signal to the citizens to begin the slaughter. Notices were sent through all the French provinces to kill all the Huguenots, and for days the bloody work went on; 30,000 people are said to have been killed. The massacre, however, did not accomplish its object, for the king was obliged soon to grant liberty of conscience to his Huguenot subjects.

**Bartolini** (*bär'tô-lē'nē*), **Lorenzo,** a celebrated Italian sculptor, was born in Tuscany

in 1777, and came to Paris while still a young man. His chief patron was Napoleon, who sent him, in 1808, to Carrara to establish a school of sculpture. After the battle of Waterloo, he went to Florence, where he died in 1850. Besides a great number of busts, he produced several groups, of which *Charity* and *Hercules and Lycus* are the most celebrated.

**Barton, Clara,** philanthropist, and president of the American National Red Cross society (1881–1904) was born at Oxford, Mass., in 1830. In 1854 she entered the United States Patent office at Washington as a clerk; but at the outbreak of the Civil War she devoted herself to the humane care of the soldiers on the battlefield, and, in 1864, had charge of the army hospitals on the James River. Congress voted her $15,000 for her relief work on the field, for organizing the search for wounded and missing men, and, in the case of the dead in Andersonville cemetery, Georgia, for marking the graves of the Union soldiers. During the Franco-German War, she assisted the Duchess of Baden in establishing and organizing hospital relief, a humane work which won her the honor of decoration with the iron cross of Germany. In 1881 she became president of the American Red Cross society, and represented the United States at the Geneva conference. In connection with Red Cross operations, she did relief work during the famine in Russia in 1892; during the Armenian massacres, in 1896; and during the Spanish-American War, in Cuba, where she also did personal work in the field. Miss Barton was author of a *History of the Red Cross*, which was issued by the United States government; and of *The Red Cross in Peace and War*. She died in Washington, April 12, 1912.

CLARA BARTON

**Barton, Rt. Hon. Edmund,** *P. C.*, first premier of the commonwealth of Australia, was born at Sydney, New South Wales, Jan. 18, 1849, and educated at the University of Sydney. In 1879 he was elected to the legislative assembly of the colony, becoming attorney-general and member of the legislative council and taking a foremost part in the movement for Australian federation. In the new federal ministry he was made prime minister, with the portfolio of external affairs.

**Bar'ye,** the unit of pressure used by scientific men. The numerical value of the *barye* is that of a pressure which exerts a force of one dyne upon an area of one square centimeter. This unit was adopted by the International Congress of Physicists at Paris in 1900. The mega-barye is a pressure of one million dynes per square centimeter. This is very exactly equivalent to the pressure exerted by a column of mercury 75 cm. high under standard conditions of gravity and temperature.

**Barye'** (*bà'rē'*), **Antoine Louis,** a French sculptor, distinguished mainly for his bronze statues of animals and animal groups, was born at Paris in 1795 He was at first an engraver and metal-worker. His famous bronze of a lion struggling with a snake, secured for him the cross of the Legion of Honor. He died at Paris in 1875.

**Basalt,** a dark, greyish-black stone of volcanic origin, a variety of up-rock, and often occurring in the form of columns, as in the columnar structures seen at Fingal's Cave, Staffa, in the Scottish Hebrides, and at the Giant's Causeway, Antrim, Ireland. From a number of still active volcanoes, such as those in Iceland and in the Hawaiian Islands, and in the case also of Etna and Vesuvius, basalt is ejected in lava-flows in a molten state, the chief constituent of the outflow being augite (pyroxene), hornblende and felspar, the latter consisting chiefly of silicate of alumina, generally hard and brittle and sometimes glassy.

**Bascom, John,** American educator, and for many years president of the University of Wisconsin, was born at Genoa, N. Y., May 1, 1827. Graduating in 1849 from Williams College and six years later from Andover Theological Seminary, he was for twenty years professor of rhetoric at Williams, and for thirteen years president of Wisconsin University. He is now professor of political science at his *alma mater*, and is the author of the following works: *Political Economy* (1859); *Æsthetics* (1862); *Philosophy of Rhetoric* (1865); *Principles of Psychology* (1869); *Philosophy of Religion* (1876); *Comparative Psychology* (1878); an *Historical Interpretation of Philosophy* (1893), together with works on ethics, sociology, etc. His later works embrace *The Growth of Nationality in the United States* (1899) and *God and His Goodness* (1901).

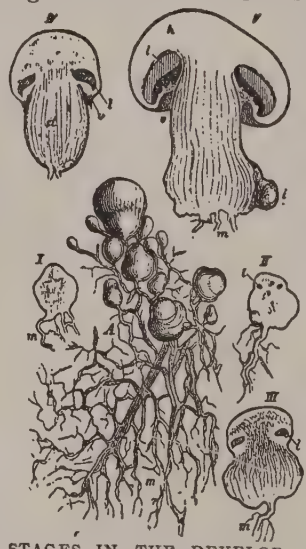
**Baseball,** the national game of America, is a development from the old English game of rounders. The first club in America was the Knickerbocker, founded in New York in 1845. The game gradually grew in favor until in 1871 it had become so popular that a professional organization was formed consisting of clubs in many of the large cities. The success of this first organization has resulted in the formation of leagues including clubs in almost every city of the United States. Some of the larger cities have clubs in more than one league. Stock companies are organized to maintain these

clubs and large amounts of capital invested. Professional players are paid salaries, which in the cases of those who are more expert are very large. During the season, which begins in April or May and runs about six months, some thousands of men are employed in playing professional base ball. Hundreds of amateur clubs play every year also. Every school or college has its team, and many professional ball players receive their training while playing in these clubs. Every professional league plays a championship series in which each club meets the other clubs of the league an equal number of times. Great interest is shown in the result of these games. The scores are telegraphed over the country by innings and the progress of the games in other cities announced.

A piece of ground in the form of a diamond ninety feet square is marked out on a level field of three or four acres. Bases are placed at each corner of the diamond, called home, first, second and third base. Each team has nine players, and in turn are fielders and batters. The fielders are: the pitcher, near the center of the diamond; the catcher, behind home base; the three basemen and shortstop, sometimes called infielders, the first and second basemen being between those bases and the shortstop and third baseman between second and third base; outfielders at right, center and left fields. When the fielders take their places, the pitcher delivers the ball, a fair ball being one that passes over the home plate, not lower than the striker's knee nor higher than his shoulder. Such a ball counts a strike, whether struck at or not, and after three strikes the batsman must run or be put out; but four unfair balls entitle the striker to a base. The batsman tries to knock the ball out of the reach of the fielders, so as to reach at least first base before the ball reaches the baseman, and as many more bases as he can make. Each base is a resting place, but, if he is touched by the ball between bases, he is put out. If he succeeds in reaching home plate, he scores one run. A batsman can only run on a fair hit, which is a ball batted within the lines running from home to first base, and home to third, and beyond; all other hits, even a mere tick are fouls, and a foul fly, if it is caught, puts out the batter. The batters bat in turn until three are put out, when the teams change places. When both sides have been batters once, an inning is ended, and nine innings make a game. The side scoring the most runs wins. The ball is thrown by the pitcher with great swiftness, and this high speed enables him to curve the ball in any direction, and so fool the batter into thinking an unfair ball is good or a fair ball bad. This is brought about by the pitcher's giving the ball a twist, the resisting air forcing the twisting sphere to curve from a straight line. The ball curves up or down, out or in, according to the kind of twist given by the pitcher. The game is easily understood; yet to be a good player requires not only agility, endurance and strength, together with good throwing and running powers, plenty of courage, pluck and nerve, but quick thinking, control of temper and presence of mind to act promptly at critical points of the game.

**Basel** (*bä'zel*), **Bâle** (*bäl*) or **Basle,** the capital of the canton of the same name, is, with the exception of Zürich, the largest city in Switzerland. It lies on both sides of the river Rhine, 43 miles north of Berne. The river is crossed by a bridge 80 feet long, which was first built in 1229. The cathedral, begun in 1010 and finished some centuries later, is still standing. The city first appears in the 4th century as a Roman military post. In the middle of the 10th century it became a free city of the empire. In 1356 nearly all its buildings were overthrown by an earthquake, and in the next century its population was greatly decreased by the plague. It joined the Swiss confederacy in 1501, and was one of the chief seats of the Reformation. There was a long contest between the city of Basel and the rest of the canton. The city claimed all the offices and rights, shutting out the country people. Peace was brought about in 1833 by separating the city entirely from the country district. The city was much more important in the middle ages than now, though it is to-day the wealthiest city in Switzerland. It has a university founded in 1460, with a teaching staff of 129 professors and 806 students. Its population is 131,914.

**Basidiomycetes** (*bā-sĭd'ĭ-ō-mī-sē'tēz*). A great group of low plants (*Fungi*), including such well-known forms as mushrooms, toadstools and puffballs. For the most part they are not destructive parasites, but are harmless and often useful saprophytes. The popular distinction between toadstools and mushrooms has no botanical foundation. The common cultivated mushroom, *Agaricus campestris*, may be taken as a type. The mycelium occurs in decaying leaves, wood, etc. in



STAGES IN THE DEVELOPMENT OF A MUSHROOM

the form of fine white threads, spoken of as the spawn. Upon this, little knob-like protuberances arise and grow larger and larger until they have developed into the so-called mushrooms. The mushroom has a stalk-like portion, the stipe, and an expanded top called the pileus. From the under surface of the pileus hang the radiating plates or gills. The surface of the gills is composed of a layer of peculiar cells whose broad ends are directed outward. Each one of these cells is called a basidium, and the whole layer of basidia is spoken of as the hymenium. From their blunt free ends the basidia put out minute branches, each one of which bears a spore. These spores are known as basidiospores and are formed in great abundance. In addition to the mushrooms and toadstools with gills, there are others with numerous spores lined with the hymenial layer, very common among which are the bracket fungi. The puffballs differ from the other forms in maturing their spores before exposing them. When mature, the spores are liberated by the drying and bursting of the puffball. The name of the group comes from the characteristic basidia which form the hymenial layer. See FUNGI.

**Basidiospore** (*ba-sĭd'ĭ-ō-spōr*) (in plants). The asexual spore of the Basidiomycetes.

**Basidium** (*ba-sĭd'ĭ-ŭm*) (in plants). A peculiar cell of the Basidiomycetes which produces branches upon which the asexual spores are borne. See BASIDIOMYCETES.

**Basket-Ball,** a modern game, dating from the year 1892 and modelled somewhat after football, though the ball (a leather-covered rubber bladder, from 30 to 32 inches in circumference and weighing from 18 to 20 ounces), instead of being kicked, is thrown or batted with one or both hands (though it may not be run with) into the basket or hammock-net receptacle, suspended on each short side of the enclosed court or oblong-shaped field, which usually covers an area free from obstruction, of from 3,000 to 3,500 square feet. The players, five in number on each side, are assigned as center and right and left guards, and right and left forwards, the guards being opposed to forwards and the centers opposed to centers. The time-contest consists of two halves of twenty minutes each, with a rest of ten minutes between. The officials, four in number, are scorer, timekeeper, referee and umpire. The playing area is usually 50 by 70 feet. The game, which was first played by members of the Young Men's Christian Association, has since become very popular, not only in athletic clubs, but in schools and colleges of both sexes. For directions as to playing and for rules, etc., see Spalding's *Basket Ball Guide* (an annual).

**Basketry,** the art of making baskets, is an ancient and simple yet useful and beautiful form of industry. It was known to the ancient Britons and to the Chinese; and the basket work of many of the Indian tribes of America shows a high degree of skill. Ozier or willow twigs are most suited to basketry; and are cultivated for the purpose chiefly in France, England, Germany and the Netherlands. Ash and oak may also be employed; and bamboo is used in China and Japan. The Japanese very cleverly enclose porcelain in basket work.

Basketry is one of the most useful of the arts for the purposes of the modern school. In the schools for Indians it already receives great attention; and it may be employed in the grades in such a way as to connect the actions of the children with an interest in American history and industry and in Indian and primitive life. It is fortunate for this purpose that few tools are required for the making of baskets, which is done for the most part by hand.

**Basques** (*bȧsks*), a curious race living on both sides of the Pyrenees. Their home forms what are called the Basque provinces of Spain, with a very small district in France. They are a farming people, though very much behind the times, using the same clumsy two-pronged wooden fork for a plow which was used by the Romans. The Basque language is unlike any other; and scholars cannot agree as to where those speaking the tongue come from or to what race they belong. Their bravery in the reconquest of Spain from the Moors won for them many political privileges, which they have kept up until very recent times. Their total number in Spain and France is about 610,000.

**Bas-Relief.** See SCULPTURE.

**Bass,** common fishes related to the perch, but now placed in a different family group, which also includes the sun-fishes or pumpkin-seeds. There are several kinds of bass. The black bass is entirely an American fish, and is among the finest game fishes of the world. Like other members of the group they prepare nests and take great care of the eggs and young. Other common kinds, all valuable as food, are the rock bass, white bass, striped bass, brass bass, etc. The last three are grouped by naturalists into a separate family. Formerly, they were all united with the perches into the perch family.

**Bast** (in plants), a name applied originally to the inner fibrous layers of the bark Strictly, the term is applied to the phloem elements, such as are added year after year by the cambium of trees. This cambium is said to add new wood on the inner side and new bark on the outside. This so-called bark, which is thus added, is the bast, which, therefore, consists of fibrous elements which lie just outside of the newest wood and within the layers of cork.

**Bastiat** (*bäs'tyȧ'*), **Frederick,** a well-known French political economist. was born

at Bayonne in 1801. In 1825 he began the study of political economy and wrote largely on the subject. He was a strong believer in the doctrine of free trade, and published several articles against the system of protection to home manufacturers. After the revolution of 1848 in France he was elected a member of the French parliament. He died at Rome in 1850.

**Bastille** (*bȧs-tēl'*), a famous fortress of Paris, built between 1370 and 1383 as a defense against the English. It was always used as a state prison. It would hold 70 or 80 prisoners, and during the reigns of Louis XIV and XV it was often full. The prisoners were rarely criminals, but men who had in some way offended the king and his courtiers. Authors, priests and scholars, besides political offenders, were often shut up there, and many remained so long that no one knew who they were or for what they had been imprisoned. At the beginning of the French Revolution it was attacked by the mob as a stronghold of tyranny, and after a fight the governor opened the gates and the people rushed in. The next day the prison was destroyed amid the rejoicings of the people. The fall of the Bastille was felt to be important because it seemed to mark the downfall of the old French monarchy.

**Basutoland** (*bȧ-sōō'tō-lănd*), is a British crown-colony in South Africa, governed by a resident commissioner under the direction of the High Commissioner. It is an elevated fertile region northeast of Cape Colony, inhabited by Basutos who rear immense herds of cattle. The population in 1911 is estimated at 404,190 natives and 1,400 whites, European settlement being forbidden. The schools, numbering 259 and chiefly conducted by missionaries, have nearly 15,760 pupils. The territory embraces 11,716 square miles, about the area of Belgium. The productions are wool, wheat, mealies and Kafir corn. Imports, consisting chiefly of blankets, plows, clothing, iron and tinware, amounted in 1910–11 to $958,500, while the exports of stock, grain and wool were $862,500. Trade is almost exclusively with Cape Colony and Orange River Colony. The governmental revenue is derived from a hut tax of one pound a year, licenses and customs rebates. For 1910–11 the receipts were $727,500; the expenditure $674,440. There is no public debt.

**Bat,** a flying mammal. The fact that bats have wings caused the naturalists of the middle ages to group them with the birds. But they are far removed from birds; they are mammals and bring forth their young alive.

They have remarkable power of flight, in which ease and grace are shown. Walking is made difficult by the fact that the knee bends backward. They are distributed all over the world, save in the very coldest regions. As a rule they are small, but the largest, the flying foxes of the Malay region, have a spread of wings measuring 30 inches. These and other large ones found in the East Indies and tropical Africa are fruit-eaters, doing much damage to crops; but most bats are insectivorous. In this country in the southeast we have one of the leaf-nosed or vampire bats, also one in California and Texas. Bats fly at night, and are reputed most active at dusk and just before dawn. Their voice is most unmusical, high-pitched and squeaking. During the day they hang head downward in sheltered places: caves, hollow trees, barns, church towers, deserted buildings, etc; they hibernate in the winter except in warm climates. The vampire bats are known to settle on the backs of horses and cattle and suck blood. They have been known to attack man, but it is a strange circumstance that the particular kind named vampire is not the culprit, but another related form—*Desmodus*. There are about 300 varieties of bats, but only a few kinds in the United States.

GREAT HORSE-SHOE BAT

While not the spirit of evil that superstition paints it, the bat is certainly a curious and mysterious little creature, and its looks are calculated to inspire dread. In *American Animals*, by Stone and Cram, the animal is thus described: "The wing, as a whole, corresponds exactly with the accepted idea of a devil's or goblin's wing; and the short head with its big shapeless ears, wide mouth and little blinking eyes is of just as impish and devilish an aspect." But its looks are misleading; the author goes on to say: "Bats are the most gentle and friendly of living things." Unfortunately, they have long had a bad name, and about these creatures of the night hang many a dark story and queer tradition. Children almost universally desire the instant death of any bat that presents itself. They should, on the contrary, look upon him as a sort of "night policeman." C. F. Hodge in *Nature Study and Life* so regards him, and tells of the work he does by night: "So few of our birds are nocturnal, and so many of our worst insect pests—the codling moth, tent-caterpillar moths, the white-marked tussock moth, owlet moths, parents of the cut-worms, June beetles, mosquitoes and a host of others—have taken refuge in the darkness, that we need the bat as the night police of our gardens. They should be accorded the same protection as our most valuable insectivorous birds. . . A family of bats

is a valuable acquisition to a farm or garden." The same author asserts that the bat may be easily tamed, gives interesting personal experiences with this creature of evil repute but warns one intending to tame it, to be careful at first of its sharp teeth and unfriendly attitude.

Bats drowse about twenty hours out of the twenty-four. They make no nests, but look out well for the newly born, carrying the young ones with them on their backs when flying through the air. "Blind as a bat" is but another superstition, for there is sufficient evidence that the creature's little eyes serve it well. Flitting mouse is one of the names given it in England and in Germany. See Cram and Stone: *American Animals*; pages in *Nature Study and Life*, by Hodge; Allen: *Bats of North America, Bulletin No.* 43, U. S. National Museum.

**Batangas** (*bà-tăn'gās*), a seaport town and district in the southern part of Luzon Island of the Philippines group, lying south of Manila and north of the island of Mindoro, in the south of the China Sea. The town is situated in a bay of the same name and possesses a fine harbor, into which the Calumpang River empties. Population of the town, 33,131, and of the district or province over 210,000. In the vicinity are lofty mountains, with the volcanic Mount Taal rising from them; while near by is Lake Taal or Bingabon. The city, which is well built, has a number of notable buildings, including a royal palace and convent. The province exports sugar and cocoanut oil, and has manufactures of cotton fabrics, dye stuffs, silk, etc. There are several railways with their branches on the island, together with banks, consulates, industrial and trade schools and a teacher's training institute. There also are much fine timber and considerable mineral deposits.

**Bata'via,** the capital and chief seaport of the Dutch East Indian possessions, is situated on the coast of the island of Java. It is very unhealthy. It has been improved, however, by drainage, and most of the European inhabitants live on the higher ground of the healthy suburbs. The Dutch government has built a large harbor, a short distance away, connected with the city by railroad and canal. Batavia is one of the trading centers of the far east. The chief exports are coffee, rice, indigo, hides, oil, tea. Among the imports are cottons, woolens, silks, machinery and American ice. About half of its trade is with Holland. A telegraphic cable connects it with the city of Singapore. Population, 116,000, of whom 9,000 are Europeans.

The province of Batavia is low, but rises gently toward the south. The religion is chiefly Mohammedan. Population, nearly 1,000,000 of whom 8,000 are Europeans, 70,000 Chinese and the remainder natives.

**Batavia,** a city in New York, is the seat of Genesee County on Tonawanda Creek, and on the New York Central, Erie and Lehigh Valley railroads, 34 miles northeast of Buffalo and 32 southwest of Rochester. Founded at the beginning of the last century, it was incorporated as a village in 1823. It is the seat of a state institution for the blind, the Holland Purchase Land Office, a public library, and a monument to Wm. Morgan, erected by anti-Masons, in memory of one of their number who, it was charged, was abducted and, it was thought, killed in 1826 for threatening to reveal the secret of Masonry. Batavia has a number of flourishing industries, including manufacturers of agricultural implements, firearms, wooden ware, shoes, plows, blinds, sashes and carriage wheels. It also has a Roman Catholic convent. Population, 13,830.

**Bateman, Newton,** American educator, and for many years president of Knox College, Galesburg, Ill., was born at Fairfield, N. J., July 22, 1822, and died at Galesburg, Oct. 22, 1897. Graduating in 1843 at Illinois College, Jacksonville, he traveled extensively in the United States, and for a time was principal of a school in St. Louis; professor of mathematics in St. Charles College Missouri; and then superintendent of city schools in Jacksonville, Ill. Later on, he became principal of the Jacksonville Female Academy and, finally, state superintendent of public instruction. In 1875, Dr. Bateman became president of Knox College, at Galesburg, Ill. While state superintendent of Illinois schools, he published a number of valuable educational reports, a codification of the school laws of Illinois and a digest of the school laws and common school decisions of the state.

**Bates, Arlo** (1850), American journalist and novelist, born at East Machias, Maine, and in 1876 graduated from Bowdoin College. From 1880 to 1893 he edited the Boston *Sunday Courier*, while later he became a professor of English in the Massachusetts Institute of Technology. He has published criticisms on the writing of English and on the study of literature, in addition to a number of works and several collections of poems. His best known works of fiction include *The Pagans* (1884), *A Wheel of Fire* (1885), *The Philistines* (1888), *The Puritans* (1889) and *Love in a Cloud* (1900). His collected verse embraces *Berries of the Brier* (1886), *Sonnets in Shadow* (1887), *A Poet and His Self* (1891), *Told in the Gate* (1892), *The Torchbearers* (1894) and *Under the Beech Tree* (1899).

**Bath,** the chief city of Somersetshire, England, about twelve miles from Bristol, on the River Avon. Its houses are built entirely of white stone, and the city has probably the finest situation and appearance in England. It has long been a fashionable

**health resort on account of its hot mineral springs.** They were known to the Romans, who built large baths there in the first century of our era, the remains of which have been discovered. There are several fine old churches, extensive buildings and beautiful parks. Richard I granted the city its charter, which was extended by George III. Population, 50,729.

**Bath, Me.,** the capital of Sagadahoc County, southern Maine, on the west bank of the Kennebec River, twelve miles from the Atlantic, and about equidistant from Portland to the southeastward and from Augusta to the north of the city. It has a large commerce, chiefly in lumber, in machines, boilers and iron and brass work, as well as a large industry in ship-building, including battle-ships and steel steamers. It has steamboat communication with Boston. It possesses some excellent schools. Population, 9,396.

**Bath'sheba,** the daughter of Eliam and the wife of Uriah the Hittite. After the death of her husband at King David's instigation, Bathsheba became the wife of the latter. She was the mother of King Solomon. See II Samuel xi and I Kings i.

**Baton Rouge** (*băt-ŭn'roozh*), the capital of the state of Louisiana, is situated on the left bank of the Mississippi River. It was one of the earliest French settlements. The state house, state university and many other public buildings are there. The city was occupied by Federal troops during the Civil War, after the capture of New Orleans, and defended by General Williams against a Confederate force led by General Breckenridge. General Williams was killed during the contest. Population, 14,897.

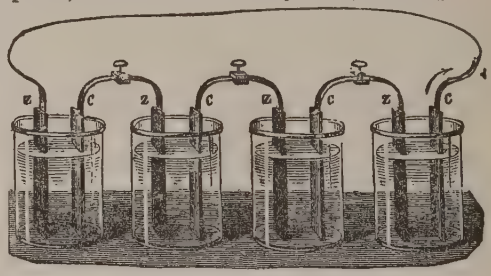
**Battenberg, House of,** members of a grand-ducal family reigning in Hesse, Germany, many of whom have by marriage and otherwise been connected with royalty on the European Continent and in Great Britain. The mother of the present reigning Grand-Duke of Hesse was Princess Alice of Great Britain, third daughter of the late Queen Victoria; this Grand-Duke (Ernest Ludwig) in 1894 married Princess Victoria, daughter of Duke Alfred of Saxe-Coburg and Gotha, a marriage which was dissolved in 1901. The Battenberg title was first conferred in 1857 on Countess Hanke, morganatic wife of Prince Alexander of Hesse, three of whose four children attained high honor as Princes of Battenberg. One, Louis Alexander (b. in 1854) is a British naval officer; another, Alexander Joseph, was from 1879 to 1886 Prince of Bulgaria; while the third, Prince Henry Maurice, in 1885 married Princess Beatrice, youngest child of the late Queen Victoria of Great Britain. Prince Henry, who was created a royal highness by his august mother-in-law and made governor of the Isle of Wight, died on his way home from Kumasi in 1896, having seen service in the Ashanti campaign. His widow, the Princess of Battenberg, still survives, and one of their children, Victoria Eugenie (b 1887), married in 1906 Alfonso XIII, King of Spain.

**Bat'tering Ram,** an instrument of war used in ancient times. It was a beam of wood, with a head of iron or bronze, like a ram's head. It was used to batter down walls and doors, and was either carried by the soldiers or fastened in a frame and made to swing. Another kind moved on rollers. To protect those who were operating it, a wooden roof was built over it and the whole mounted on wheels. The ram varied in length from 60 to 120 feet, the head sometimes weighing over a ton, and as many as a hundred men were needed to manage it. The Romans borrowed it from the Greeks, but who invented it is not known.

**Battersea,** a suburb of London, on the Surrey side of the Thames, with a fine park, 185 acres in extent. Chelsea Hospital has its seat here.

**Bat'tery.** See ARTILLERY.

**Bat'tery** (electric), any combination of voltaic cells, whether used for the purpose of furnishing an electric current or merely to produce electrical pressure. For most purposes, the cells of a battery are joined up in




SIMPLE GALVANIC BATTERY

series, that is, the positive pole of one cell is connected with the negative pole of the next cell, and so on (as shown in above cut). But if the object be to make a battery of the least possible resistance, the cells are joined in parallel, that is, all the positive poles are connected together and all the negative poles connected together, thus forming one large cell. If the object be to obtain the largest possible current, then the cells are so arranged as to make the internal and external resistances of the circuit equal.

**Battle Creek, Mich.,** a city in Calhoun County, on the Kalamazoo River, southwestern Michigan, 120 miles west of Detroit and 44 miles southwest of Lansing, the capital of the state. It is located on the main lines of the Michigan Central and the Grand Trunk railroads. It has large manufactories, chiefly of farm implements, including threshing-machines, and of flour and knitting mills, a boiler works, pipe-organ

factory, etc. It is the seat of Battle Creek College, controlled by the Seventh-day Adventists, and possesses an extensive sanitarium and manufactories of health-foods. Its two streams supply its factories with good water-power. The city has an admirable system of public and parish schools, and has three business colleges. The Y. M. C. A. building and the public library are the gifts of the late Chas. Willard. The late John Nichols presented the city a fine hospital. Population, 28,122.

**Battleford**, Saskatchewan, is a small town near the confluence of the Battle and North Saskatchewan Rivers, ninety miles by stage from Saskatoon on the northwesterly spur of the Canadian Pacific Railway from Regina to Prince Albert. It is distant 2,328 miles from Ottawa, and on the direct line of the projected Grand Trunk Pacific.

**Battle Hymn of the Republic,** written by Mrs. Julia Ward Howe to the tune "Glory Hallelujah," familiarly known as "John Brown." The tune itself is of southern origin, being ascribed to William Steffe, a composer of Sunday-school music. It was first heard in Charleston, South Carolina; then in various camp-meetings and among colored congregations until, in time, it made its way to the north. The original words were a hymn, beginning "Say, brothers, will you meet us?" "John Brown's Body" was an improvisation originating in the Twelfth Massachusetts Regiment, at the time it was at Fort Warren, in Boston Harbor. The singing of the song by the regiment as it crossed Boston Common and marched through the streets of New York caused it to become national property. Mrs. Howe's poem, "Mine Eyes have Seen the Glory of the Coming of the Lord," was the inspired result of an endeavor to set more fitting words to the music than those ordinarily sung at the camp-fires of the soldiers. The song has been more popular than any other of its kind and time, and is well known in the military circles of foreign nations. For the full story see *The History of American Music*, by Louis C. Elson. (Macmillan pub.)

**Bauer** (*bou'ĕr*), **Bruno,** a German philosophical and historical writer and biblical expositor of the Hegelian (rationalistic) school, was born at Eisenberg, Germany, Sept. 6, 1809, and died near Berlin, April 13, 1882. His writings embrace a number of critiques on the Gospels and Pauline Epistles; one on Strauss's *Life of Jesus;* an *Exposition of the Religion of the Old Testament;* besides a *History of the French Revolution to the Establishment of the Republic* and a *History of Germany during the French Revolution and the Rule of Napoleon.* He also published *Philo, Strauss, Renan and Primitive Christianity* and a work entitled *Disraeli's Romantic and Bismarck's Socialistic Imperialism.* On theological subjects, Bauer was a daring and destructive critic (the Voltaire of Germany he has been called); he denied the historical truth of the Gospels, and regarded the Christian religion "as overlaid and obscured by accretions foreign to it."

**Baur** (*bour*), **Ferdinand Christian,** an eminent German biblical critic and Protestant theologian, was born in 1792, and died at Tübingen, Dec. 2, 1860. A profound scholar and influential writer on biblical exegesis and Christian doctrine, Baur, in 1826, became professor in the evangelical faculty of Tübingen University, and labored there until his death. His writings, which deal chiefly with Christian dogma, embrace *The Christian Gnosis; The Doctrine of the Atonement; The Doctrine of the Trinity and the Incarnation, Critical Inquiries Concerning the Canonic Gospels, a History of Christian Doctrine to the End of the 18th Century; Paul the Apostle of Jesus Christ,* etc., etc.

**Bauxite** (*boks'it*), a mineral ore, of a white, yellow, brown and red color, used with cryolite in the manufacture of alum, also for fire-brick, etc. It is found at Baux, France (whence its name) also in Austria, in the north of Ireland (chiefly in Antrim) and in North America, principally in Georgia, Alabama and Arkansas. In 1911 the production in the United States was 155,618 tons, the market value of which was $750,649.

**Bavaria,** one of the states of the German empire and the second in size. It is divided into two parts, which are separated by Baden and Hesse-Darmstadt, the eastern division being fully eleven-twelfths of the whole. It covers 29,292 square miles, divided into eight districts, with a population of 6,876,497. The capital is Munich (population, 595,053). The southeast, northeast and northwest are walled in by high mountains, and the interior is cut up by small ranges and is well wooded. It is touched by the Rhine and Danube, and a canal connecting the two rivers passes through Bavaria, thus joining the Black Sea and the German Ocean. It is a farming country and the soil is very fertile. Large quantities of grain are grown, and the grape and hop for wine and beer are cultivated on a large scale, as more beer is manufactured here than in any other country in Europe. The Roman Catholics outnumber the Protestants about five to two. It has a fine system of education, under the direction of a minister of public instruction, with primary schools, high schools and three universities. The library at Munich is one of the largest in Germany.

The kingdom of Bavaria is a constitutional monarchy. When, in 1870, it became a part of the German empire, it retained many of its old privileges, such as the control of

home affairs. The army is modeled after the Prussian system, and is under the command of the king of Bavaria in time of peace, but under the German emperor during war. The peace strength of the Bavarian army is 67,000 men. The Bavarians are the descendants of the ancient Boii, who were under the power of the Romans, and afterward formed a part of the empire of Charlemagne. The country was given to the Count of Wittelsbach in 1180, and has been under that house ever since. On the outbreak of the Franco-Prussian War, in 1870, Bavaria joined Prussia against France, and soon after became part of the new German empire. Prince Ludwig became king, as Ludwig III Nov. 5, 1913 following the deposition of the mad King Otto for whom he had ruled as regent for a number of years.

**Baxter, Richard,** a distinguished English preacher, was born in 1615. He had great influence as a chaplain in the Puritan army in the Civil War, which began in 1642, using all his eloquence to soften the stern political and religious views of the soldiers. His best known work is *The Saint's Everlasting Rest.* Other works are *Now or Never, Call to the Unconverted* and *The Reformed Pastor.* He died at London in 1691.

**Bayard** (*bī'ĕrd*), **James Asheton,** American statesman, was born at Philadelphia in 1767, and died at Wilmington, Del., in 1815. In 1796 he was elected to congress as a Federalist, and became noted as an orator, constitutional lawyer and leader of the house. In 1801 he was offered, but declined, the ministership to France. In 1804 he was elected senator from Delaware, and sat in the chamber until 1813, when he was chosen by President Madison, along with Albert Gallatin, to conclude peace with Great Britain, by the Treaty of Ghent. His son, of the same name, and father of Thomas Francis Bayard, born at Wilmington in 1799 and dying there June 13, 1880, was Democratic senator from Delaware during the years 1851–64 and 1867–69.

**Bay'ard** (*bā'ĕrd*), **Pierre Du Terrail, Chevalier De,** a famous French knight, was born near Grenoble in 1476. He served under Charles VIII in an expedition against Naples, and in the wars against the English and Spaniards he distinguished himself by his bravery and nobleness of character. In the reign of Francis I he gained a great victory for the king at Marignano, and defended the city of Mézières against Charles V, for which he was called the Savior of his Country. He was killed in a battle at the river Sesia, Italy, in 1524. He was so highly thought of for his virtues that his death was mourned by his enemies as well as by his friends. He is known as "the knight without fear and without reproach."

**Bayard, Thomas Francis,** American statesman and secretary of state (1885–89), was born at Wilmington, Del., Oct. 29 1828, and died Sept. 28, 1898. His early manhood was spent in the practice of the law. In 1869 he succeeded his father as senator from Delaware, when he served continuously until 1885; then he entered Mr. Cleveland's cabinet as secretary of state. In 1880 and 1884 he was unsuccessful in obtaining the nomination, on the Democratic ticket, for the presidency. In 1893 he was appointed ambassador to England, the first to hold that rank as a representative of the United States.

THOMAS FRANCIS BAYARD

**Bay City,** county seat of Bay County, Mich., noted for its beautiful streets and fine public buildings, is situated on Saginaw River, three miles from Saginaw Bay. The population, including West Bay City and Essexville (an important suburb), is now 54,000. It was first platted as the village of Portsmouth in 1836 and twenty years later as Lower Saginaw. Lumber and salt were formerly its main productions. Planing mills and lumber-yards are still in evidence, with wooden-ware works and box-factories coming to the front, while beet-sugar factories and coal mines now add to its prosperity. Lake transportation companies center here, and its shipyards should not fail to be mentioned. Large chemical works, industrial works for building heavy railroad wrecking cranes, bicycle works, foundries, etc., furnish employment to many. Bay City is a railroad center and a distributing point for a large section of country. It has 19 public schools, 287 teachers and an enrollment of 8,000; also a business college, a private kindergarten and seven parochial schools with an enrollment of 3,500.

**Bay-de-Verde,** an electoral district of Newfoundland. Population about 10,000; chiefly Methodists and Roman Catholics; occupations, fishermen and those engaged in the catching and curing of fish; chief towns; Bay-de-Verde, Cower, Island Cove, Grate's Cove, Old Perlican and Freshwater.

**Bayeux** (*bà'yĕ*) **Cathedral,** in the city of Bayeux, is said to be the oldest cathedral in Normandy. It was rebuilt by William the Conqueror, after a fire in 1077, but most of the present building dates from 1106 to the 13th century. On the west front are two steeples built in the 12th century and

three beautiful sculptured porches. Here was kept for a long time the famous Bayeux tapestry.

**Bayeux Tapestry,** a roll of linen cloth about 230 feet long and 20 inches wide, on which is embroidered a panorama-like picture of the conquest of England by William the Conqueror. It is now preserved in the public library of Bayeux, Normandy, France. It is divided into seventy-two scenes, most of which have Latin inscriptions. The panorama begins with a picture of Harold taking leave of Edward the Confessor before setting out for Normandy, and ends with the battle of Hastings, the death of Harold and the flight of the English. It has usually been supposed that the tapestry was embroidered by Matilda, wife of William the Conqueror; but others believe it to have been worked for the Bayeux cathedral under the direction of Otho, bishop of Bayeux and a half-brother of William the Conqueror. It was discovered in the Bayeux cathedral in 1728, Lancelot having described an illuminated drawing of part of it in 1724. It is very valuable as a record of the customs and costumes of the period, and nearly fifty books have been written about it.

**Bayonne** (*bā′yōn′*), **N. J.,** a thriving town in Hudson County, adjoining Jersey City, on the long tongue of land that separates New York and Newark Bays. It is traversed by the Central Railroad of New Jersey, and is separated from Jersey City by the Morris Canal and from Staten Island by the Kill-von-Kull. It has, moreover, excellent railroad communication with New York City. It possesses many important industries, the chief of which are oil refineries, boiler and electrical works and chemical works. At its docks there is usually great activity in oil and coal-shipping. Population, 64,500.

**Bayreuth.** See BAIREUTH.

**Bay Tree,** a name given to a number of trees and shrubs resembling the laurel. The large-leaved evergreen, common in shrubberies, called the common or cherry laurel, is sometimes called bay laurel. The true bay leaves are used for flavoring. Bay rum, used by perfumers, is a liquid got by distilling rum in which bay leaves have been boiled. The leaves were also used to decorate houses at Christmas and at weddings.

**Bazaine** (*bä′zān′*), **François Achille,** a French general, born in 1811. He enlisted as a private and served in Algiers and Morocco, in the Crimea and in Italy. In the French invasion of Mexico, he became commander-in-chief of the French forces. In the Franco-Prussian War he was commander of the main French army, and after the bloody battles of Mars-le-Tours and Gravelotte he was shut up in the city of Metz, where he surrendered on October 27, 1870. He was tried by courtmartial and sentenced to death, which was afterward mitigated to twenty years' imprisonment. He escaped and fled to Madrid, where he died in 1888.

**Beaconsfield, Lord.** See DISRAELI, BENJAMIN.

**Bear,** a large animal, omnivorous as to food, found in both warm and cold climates. The stout body, with thick legs and very short tail, is covered with long, shaggy fur; the whole sole of the foot rests upon the ground, and the claws are adapted for digging and climbing. Bears are found in Europe, Asia and America; those in cold climates being more fierce and less content with vegetable food than those in warmer regions. Bears generally are very fond of fruit, honey, nuts and roots, and when berries and green food are plentiful will often pass animal food untouched. The latter includes mice as well as elk and bison steak, and of ants they are very fond. Bears swim with ease, and some climb. In cold countries, at the beginning of winter, they hunt caves or hollows and sleep there until spring. The young bears are born during the winter, usually two in a litter, very small and helpless at first and almost hairless. Bears are very playful animals, have a great sense of humor, and generally are good-tempered and cheerful. Brown bears are plentiful in Europe and Asia. Comparatively recently new American bears have been described; one, the glacier bear living about Mt. St. Elias, and an enormous brown bear of Alaska which perhaps is the largest of living bears. Other varieties

BROWN BEAR

of bears live in Syria, the Himalayas, Russia, the Malayan region and the Andes. Bears of North America are the polar bear of the far north; the big brown bears of Alaska; the grizzly bears, ranging from Mexico to Alaska; and the black bears, found generally in our forest regions.

The white or polar bears of the Arctic regions are very large, often measuring nine feet in length, and are very strong. They

swim rapidly, and live largely on fish. They are more apt to attack man than any other variety. The males do not hibernate in the winter, but the females remain in sheltered places through the winter and bear their young. They are pure white all the year round. They swim rapidly, are the best swimmers of the bear family, can swim for hours in icy water, and are excellent divers.

POLAR BEAR

The Kadiak bear or the great brown bear sometimes grows as large as an ox. It belongs to Alaska and adjacent islands. In the spring it wears a coat of beautiful golden yellow, which later turns to brown. This enormous bear has markedly high shoulders and a massive head. The glacier bear belongs to the glacier region of Mt. St. Elias. Little is known of it. It is reputed shy and fierce, its general color bluish-gray.

The grizzly is the most ferocious of bears, a great, lumbering, fierce fellow. Before the day of the long-range rifle he was very hard to kill, a great fighter, but now his numbers are much decreased. He is peculiar to North America, and is found mainly in the Rocky Mountains. The fur is dull brown, around the head somewhat gray. The claws are long and curved. Its strength is equal to dragging a bison, and in the days when "buffalo" was plentiful on the plains it was a persistent hunter of this animal. It now preys on horses and cattle, but wanting these must manage with such minute game as mice. It greedily eats berries, wild plums, green fodder, almost everything it can chew. The adult grizzly cannot climb trees, but when he has found a good hunting range he will reach up as high as he can on the trunk of a pine and there make a mark that means "Keep Off"—a challenge well understood by animals passing that way.

The American black bear is thought by many to be a variety of the brown bear. In our forest regions both east and west, north and south, it is found, still quite common in lonely mountains and in timbered land. It is all inky black save for a brownish tinge or dirty white on the face, and some, called cinnamon bears, are dark chestnut in color. It is naturally timid and inoffensive, and stands in terror of man, but will fight savagely if attacked or called on to defend its cubs. Except in the spring it lives chiefly on vegetable food. It is excessively fond of blueberries, also of honey, and will endure many stings from the bees to get possession of the sweet it craves. After the long winter's fast it eats snakes, bugs, fish, anything it can get; when eager for animal food, it will kill cows, sheep, and steal from the pig-pen; in the fall, nuts, acorns, wild grapes and mushrooms vary its fare. The black bear usually carries its head low, and is highest in the middle of its back. It climbs with ease and runs swiftly. The young cubs are very playful and good tempered, but grow to be much too rough for close association. See Hornaday: *American Natural History;* Stone and Cram: *American Animals.*

**Bear, Greater and Lesser,** two groups of stars or constellations in the northern sky. In the Great Bear are seven very bright stars, forming the "dipper." The body of the "dipper" is made by four stars forming a quadrangle, the other three, which make the handle, being nearly in a straight line. The straight line which passes through the two stars on the side opposite the handle, passes also very nearly through the pole star; distant about five times the length between the two stars. These two stars are therefore called the pointers. In the Lesser Bear a group of stars also forms a dipper, but the stars are not nearly so bright.

The end of the Little Bear's tail is the Pole Star, which lies almost exactly over the north pole. The Great Dipper is easily recognized by the star-gazer, and remembering the pointers, then locate the Pole Star, and the Little Dipper may readily be found. In most star-maps these constellations are called by their Latin names, *Ursa Major* and *Ursa Minor.* See Ball: *Starland,* also *The Story of the Heavens*; Moulton: *Introduction to Astronomy.*

**Beard, William Holbrook,** an American portrait and animal painter, was born at Painesville, Ohio, April 13, 1825, and died February 20, 1900. After studying art in Europe, he settled in New York, where he was very successful in painting pictures of animals. He had quite a gift for depicting with humor animal life, and for giving human expression to the faces of his animal subjects. Some of his best known pictures are *Kittens and Guinea Pig, Bears on a Bender, Voices of the Night, Who's Afraid, Raining Cats and Dogs,* etc. A collection of his sketches appeared in 1885, with the title: *Humor in Animals.*

**Be'atrice, Neb.,** a city, the chief town of Gage County, in Nebraska on Big Blue River, 40 miles south of Lincoln and 90 miles southwest of Omaha. It is reached by the Union Pacific, Rock Island, Burlington and Missouri River and other railroads,

which give facilities to its growing trade in flour, lumber, agricultural implements and cement and stone from important quarries in the vicinity. The city is well laid out and possesses many fine buildings, including court house, municipal buildings, banks, churches, schools and public library, besides a state Institute for the Feeble-Minded. The city owns and operates its own water-works, while it derives from the river good water-power for its industries. Settled in 1859, Beatrice became a city in 1873. Population, 9,356.

**Beauharnais** (*bō'ăr'nā'*), **Eugène de,** a French soldier and statesman, was born at Paris in 1781. His mother (Josephine) became the wife of Napoleon Bonaparte. He held many positions in the French army, and in 1805 was appointed viceroy of Italy, filling the position with ability. He showed courage and military capacity in the campaigns against Austria and Russia. He conducted the retreat from Russia in a masterly manner. After the overthrow of Napoleon, he lived at Munich, the title of Duke of Leuchtenberg being granted him by the king of Bavaria, whose daughter he had married. He died there in 1824.

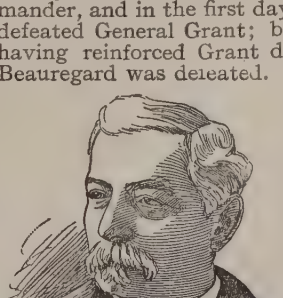
**Beaumarchais** (*bō'mär-shā'*), **Pierre Augustin Caron de,** a celebrated French dramatist, was born at Paris in 1732. He became so skilled as a musician that he was appointed to teach the daughters of King Louis XV to play on the harp. He wrote, as a defense of himself against a charge of fraud and forgery, his well-known *Memoirs*, which is a masterpiece of French writing and gave him quite a reputation. During the American Revolution, he supplied the American army with a large quantity of arms and ammunition, for which he received the warm thanks of Congress, but not the money payment which was promised. One fourth of the debt was paid thirty-six years after Beaumarchais was dead. He was a supporter of the French Revolution, and was obliged to leave France for a time. His greatest drama is *The Marriage of Figaro*. *The Barber of Seville* was also very successful. He died at Paris in 1799.

**Beaumont, Texas,** a city, the seat of Jefferson County, situated at the head of tidewater navigation on the Neches River on which it does a large trade in the shipment of yellow pine and cypress lumber and shingles via Sabine Pass. It is reached by a number of railroads, including the Santa Fe, Southern Pacific, Frisco & Kansas City Southern, operating eleven lines in all. It lies 83 miles northeast of Houston. Its industries connected with the lumber, oil, foundry and machine shop trades are expanding rapidly and this of recent years has given an impetus to the developing of the city. Population, 31,000.

**Beaumont** (*bō'mŏnt*), **Francis,** an English dramatist, was born in 1586. He was educated at Oxford University, and afterward studied law, but neglected it for literary work. He became a great friend of the dramatist, John Fletcher, and nearly everything he wrote was in partnership with him. He was also acquainted with Ben Jonson and other writers of the time. The finest of the dramas which the two friends, Beaumont and Fletcher, wrote together are *The Maid's Tragedy* and *Philaster*. *The Coxcomb* and *Cupid's Revenge* are also well known. Beaumont was one of the most gifted writers of the age of Elizabeth. He died in 1616.

**Beaumont, William,** an American surgeon (1785–1853). While he was in the United States army he had to care for a man who had been shot in the left side. The patient got well, but the wound in the side healed without closing up, leaving a large hole through which Dr. Beaumont was able to watch the process of digestion in the stomach. He thus found out and described the action of gastric juice in digestion, the process not being definitely known before. His observations and experiments were of great importance.

**Beauregard** (*bō're-gärd'*), **Pierre Gustave Toutant,** an American general, born in 1818 near New Orleans. He graduated at West Point in 1838, and won considerable distinction in the Mexican War. He was stationed until 1860 at New Orleans, in charge of engineering works on the Mississippi and the Gulf, and also had the oversight of the building of the mint. He resigned his position as superintendent of the Military Academy at West Point to become a brigadier-general in the Confederate army in 1861. He directed the attack on Fort Sumter, and defeated General McDowell at Bull Run. In the spring of 1862 he was second in command of the Department of Tennessee. At the battle of Shiloh, after the death of General Johnston, Beauregard became commander, and in the first day's fight partially defeated General Grant; but General Buell having reinforced Grant during the night, Beauregard was defeated. He fell back on Corinth, which he fortified and held until May 30, when he made a masterly retreat to Tupelo. Owing to failing, health, he was for a time relieved from active service, but later took command of the defense of the southern coast. While stationed at Charleston, he defeated the attacks



GENERAL BEAUREGARD

of General Gillmore and Admiral Dahlgren in 1863. In 1864 he successfully resisted General Butler, and held Petersburg against Grant's attack until the arrival of General Lee. He later had the task of resisting General Sherman's march to the sea. After the war he became president of the New Orleans and Mississippi Railroad, and in 1878 was made general manager of the Louisiana Lottery Company. He died near New Orleans, February 20, 1893.

**Beaver,** a gnawing animal of very interesting habits, related to squirrels, but living in the water. Beavers live in Europe, Asia and North America, although there is believed to be only one kind. They are about two feet long, one foot high, and weigh from forty-five to sixty pounds. The beaver is, therefore, one of the largest and heaviest of the gnawers. It has a very unusual tail, oval, flat and scaly, about ten inches long and three inches wide. The rest of the body is covered by fur of two kinds: a soft, thick, gray under-fur, overlaid with polished and glistening chestnut-brown hairs. The fur is one of the most valuable furs of commerce.

BEAVER

Formerly, this animal was distributed through the wooded part of the northern hemisphere, but it has been hunted till it is almost exterminated in settled portions. In the United States it is scarcely found east of the Mississippi; occasional colonies are known, however, in Maine, Virginia, and a few other places. Though numbers exist in Siberia, the beaver is now rare in the Old World.

The beaver feeds mainly on bark of trees (willow, poplar, birch, etc.), roots, buds and leaves. It gnaws down trees not only for constructing dams and houses, but to get the finer branches and twigs for food. The front teeth are remarkably large, and of deep orange color on the outside. They are like the front teeth of the squirrels, rabbits and other gnawing animals, hard in front and softer behind, so that by use they get worn to chisel edges. With these teeth they gnaw through trees as large as nine feet in circumference. Their hind feet are webbed and the flattened tail serves as a sculling oar and rudder, which makes them splendid swimmers and divers. They can remain two minutes under water. They are social animals; a family of several members usually live in one house; and sometimes a large number of families collect together in a community. Usually there are four young ones at a birth. The young beavers leave home in their third summer and set up new households, and when communities become too large for comfortable living, an emigration takes place. Once in a while a solitary old bachelor is found, a recluse living alone in his burrow.

Their habits are remarkable; they usually work at night, and so diligently, that "working like a beaver" has become a common saying. They build houses, lodges and dams in forest brook, well-concealed from haunts of man. The simplest form of house is merely a burrow opening under water. The lodges are more elaborate and are of three kinds: the island-lodge, built on a small island in a pond; the lodge built on the banks of streams and ponds; and the lake-lodge on the sloping shores of lakes, with a considerable portion of the hut out of water. A description of one of the island-lodges will be sufficient: It is an oven-shaped house of sticks, grass and moss woven together and plastered with mud, so strong as to protect the inhabitants from beasts of prey. The room inside may measure eight feet in diameter and two or three feet in height, and the floor is carpeted with bark, grass and wood chips. There are two entrances, both underneath; one is straight, through which the wood for winter food is passed; the other, called the beaver entrance, is often winding in its course. Both these entrances open into a moat around the house, too deep to freeze easily, so that the beavers are not likely to be shut in. When the trees near the water are used up and the land is too uneven for rolling, log-slides or canals are cut in the bank to carry down the timbers. These may be hundreds of feet long and about a yard in width and depth.

So they may easily pass back and forth under the winter's ice, and that they may have room to store food, dams are built to increase the water about the lodges. They are often of great size—one is reported as being 1,530 feet long. The first step in dam-building is selection of a suitable site, a narrow place with firm bottom. Then work is begun on felling trees. They commence by gnawing deep parallel grooves about the trunk, in chips pull out the wood between the grooves; repeating this until nothing is left but a few last fibres, the trunk is ready to fall. Some say they always plan for the tree to fall toward the water, others declare they work haphazard. After the tree is down the beavers set to work lopping off branches and cutting it in lengths they can drag into the water. The short logs, dragged or floated to the desired spot, are sunk lengthwise across the current and kept down by means of stones, sod and mud loaded on by the beavers. To provide for winter needs, they collect a goodly supply of birch, willow and poplar,

which they stack near their homes, sinking the ends well in the mud so the gathered store cannot float away.

During the 17th and 18th centuries beaver skins held first place in the world's fur trade. For many years the beaver was called upon to furnish hats for men of fashion. So great was the demand for the fur that in the western part of Canada and the United States beaver-skins passed as currency. Where once they were almost unbelievably plentiful, their numbers now are fast decreasing. Rigid protection in eastern Canada is reported, and a plea has been presented for a game and fur preserve in the Canadian northwest. See Morgan: *The American Beaver and His Work; McClure's Magazine*, April, 1901; *Scientific American, Supplement*, August 13, 1904; *Plea for Establishment of Game and Fur Preserve*, Report of 8th International Geographical Congress.

**Beaver Falls, Pa.,** a city of Beaver County, thirty miles northwest of Pittsburg, located on the Beaver River near its junction with the Ohio. It has excellent water power and in addition there is an abundant supply of coal and natural gas; hence it is an important manufacturing point, the principal products being fence wire, nails, shovels, files, saws and other articles manufactured from the finer grades of steel. Pottery is produced to some extent and also glassware. Here is located Geneva College, an institution affiliated with the Reformed Presbyterian denomination, having in attendance a large body of students. Population, 14,000.

**Bebel** (*bā'bĕl*), **Ferdinand August,** an able and influential leader of the German Socialists in the Reichstag, of which he served as member for over thirty years. Born at Cologne in 1840, he early in life became a turner by trade, and as early identified himself with workingmen's labor organizations, out of which he built up a progressive social-democratic party having a compact vote of three millions. Few Germans of his time engaged in public affairs made a more notable name than he, as his influence in labor-congresses bore witness, not to speak of the sympathy felt for him by large masses of followers, owing to his repeated imprisonments on a charge of high treason and of *lese-majesté* against the German Emperor. Herr Bebel was a powerful and convincing speaker, an extensive contributor to socialistic journals and a writer of books, among them a life of the French socialist Fourier, and *Die Frau und Der Socialismus*. He died in 1913.

**Bechuanaland** (*bĕchŏŏ-ä'nȧ* or *bĕk'ū-ä'na-lănd*), is a native territory in South Africa annexed to Cape Colony in 1895. It contains 51,524 square miles and a population (estimated for 1908) of 94,608, of whom 9,608 were whites. It is traversed by the Cape-to-Cairo Railroad.

**Bechuanaland Protectorate, The,** has an area of about 275,000 square miles, about that of British Columbia, and a population (1905) of 137,832, only 1,000 being whites. It is bounded west and north by German Southwest Africa, north by Zambezi River and British Central Africa, east by Matabeleland and Transvaal and south by British Bechuanaland and Molopo River. The chief tribes are the Bamangwato, Bakwena and Bangwaketse. These and the others are governed by a resident British agent responsible to the High Commissioner of South Africa, but Khama and two other chiefs rule their peoples in subordination to the resident. No licenses for the sale of spirits are granted. Herding and farming are the chief industries. Much of the land is held by native chiefs, who also collect the hut-tax, but the people are peaceful and contented. The Cape-to-Cairo Railway passes through the protectorate, and the telegraph connects it with Cape Town, Portuguese East Africa, Rhodesia, Ujiji and the whole world. In 1905–6 the income was almost $143,265; the expenditure about $373,915; and the grant-in-aid for 1906–7, $220,000.

**Beck'et, Thomas à,** an English archbishop, born in London about 1118; murdered in Canterbury cathedral, Dec. 29, 1170. His father, a London merchant, was a friend of Theobald, archbishop of Canterbury, who thus became acquainted with the young man, helped him in his education, and induced him to enter the church, also bringing him to the notice of King Henry II, who soon after appointed him lord chancellor of England. Becket showed great ability, and also distinguished himself in Henry's war against France. He lived in great magnificence and was constantly in the company of the king. In 1162, on the death of Archbishop Theobald, the king had Becket appointed archbishop of Canterbury. Immediately Becket's conduct changed. Instead of the brilliant courtier and statesman, he became grave and austere, and began to oppose the king, making himself the champion of the rights of the church against the king's demands. In 1164, at Clarendon, the king had resolutions drawn up which declared what the king's rights and what those of the church were on certain disputed points. These Constitutions of Clarendon, as they were called, Becket at first refused to agree to, but finally signed them. As soon as he left the place, he repented having signed them and declared that they ought not to be observed. He was then obliged to flee to France. In 1170 he was allowed to come back; but he at once began his old opposition to the king, who was then in Normandy. The king is said to have angrily cried out: "Will no one rid me of this pestilent priest?" At once four knights

left the king, and, going to Canterbury, murdered Becket at the altar of the church. He was declared a saint by the pope, and his tomb at Canterbury became a shrine visited by pilgrims from all over the world. But the beautiful shrine was destroyed by Henry VIII, and the cathedral was partly destroyed by fire in 1872.

**Becquerel** (*bĕk'rĕl'*) **Rays.** About one year after Röntgen made his beautiful discovery that X-rays could be produced by the use of an induction coil and a vacuum tube, a French physicist, M. Henri Becquerel, found that the metal *uranium* and its compounds are continually emitting rays which possess almost exactly the same properties as X-rays. This new radiation which is emitted spontaneously by uranium has received the name Becquerel rays. Experiments have shown that these rays possess the following properties:

1. They are propagated in straight lines, as is ordinary light.
2. They affect the photographic plate, as does ordinary light, though in a much less degree.
3. They traverse thin plates of opaque bodies, unlike ordinary light.
4. They are *not* reflected, refracted or polarized, as is ordinary light.
5. They render the air through which they pass a conductor of electricity, or, as the chemist says, they ionize air.

A full account of this discovery is to be found in Becquerel's papers, which are published in the *Comptes Rendus* for the first few months of 1896.

**Bede** or **Beda,** surnamed The Venerable, an English monk, scholar and church historian, was born in 673, in what now is the county of Durham, and died at Jarrow, at the monastery of St. Paul, in 735. He is said to have been the most learned Englishman of his day, and in the seclusion of his cell he wrote, besides his important *Ecclesiastical History of England,* which was translated from the Latin by King Alfred into Anglo-Saxon, a number of commentaries, homilies, hymns and lives of the saints.

**Bedford, Indiana,** is the county seat of Lawrence County, on the Baltimore and Ohio Southwestern, Chicago, Indianapolis & Louisville and Terre Haute & Southeastern railways, 75 miles northwest of Louisville. It has valuable quarries near by, chiefly of a fine, durable oolitic limestone, much in request for building purposes. Its other industries include veneering mills and lumber factories, besides railway shops, etc. It is the seat of Bedford Business University and public schools that employ sixty teachers. Population 11,000.

**Bed'ford, Admiral Sir Frederick George Denham,** G.C.B., K.C.B., C.B., has been governor of Western Australia since 1903. He was born in 1838, the son of Vice-Admiral Bedford, and entered the royal navy in 1852. His service has been interesting and extensive. He was present at the bombardments of Odessa, Sevastopool and Sveaburg, commanded the Shah in its engagement with the Huascar, organized the Nile flotilla in 1884, commanded the expeditions against Fodi Silah in Gambia in 1894, against Nana of Brokenin on the Benin the same year and against King Koko of Nimbi on the Niger the year following. He was one of the lords of the admiralty from 1889 to 1892 and from 1895 to 1899, taking command of the North American and West Indies station in the last named year and retaining it until he received his present appointment.

**Bedford, Duke of.** See JOAN OF ARC.

**Bedloe's Island,** in New York harbor. In 1800 it was ceded to the United States government, and in 1841 Fort Wood was built on it. Within the fort now stands Bartholdi's great statue of *Liberty Enlightening the World,* presented by France to the United States.

**Bedouins** (*bĕd'ŏo-ĭnz*), meaning "dwellers in the desert," are Arabs who lead a wandering life. While the desert of Arabia is their central place of abode, they have spread themselves over many countries, and are now to be found from the western boundary of Persia to the Atlantic and from the mountains of Kurdistan to the negro countries of Sudan. In a few regions they have mixed with other nations; but as a rule they have kept their separate character and independence. They now form a seventh of the population of Arabia. They have seldom acted as a united people in the world's politics. They are herdsmen and generally robbers, and recognize little law except tribal custom. One or more families form the core of a tribe, a kind of aristocracy, and from their number a superior sheikh is chosen to lead them and to judge between those engaged in disputes, if they choose to come to him. They manufacture their own woolen clothes, and their food is mainly obtained from their herds, though they also eat rice, honey, locusts and even lizards. Certain tribes, however, live in houses and practice agriculture.

**Bee,** an insect related to wasps and ants. Bees abound in all parts of the world, numbering about 5,000 species. All when adult feed on sweet juices. There are the solitary bees, each female providing a nest for her young, as the carpenter bee and others; the social bees, so called because many work together to build a common home; guest bees, that lay eggs in the nests of others. The carpenter bees bore tunnels in dead tree trunks, fence posts, even in the joists of buildings. The burrow runs across the grain at first, then at right angles to this a deep burrow is made, and other galleries may be added. These bees are indefati-

gable workers and very hard to discourage. Carpenter bee, digger bee, potter bee, cuckoo bee, honey bee, bumblebee—all are of much interest and well-worth close study.

The social bees, including the bumblebee and honey bee, are the best known. The latter was originally introduced from Europe into America, more than three centuries ago, and escaping swarms stocked the forests with what are now called wild bees. There are three kinds of individuals: the queens, the workers or undeveloped females and the drones or males. The queens and workers have stings connected with poison sacs, but the drones have no stings. Each kind is produced in a particular kind of cell. That in which the queen is reared is especially large. The undeveloped queens are provided with a kind of food called royal jelly. The cell of the drone is larger than that in which the worker is reared. It is possible, however, for the active workers to enlarge a cell that would ordinarily produce a worker, and by changing the food to royal jelly cause the young grub to develop into a queen. When several queens mature at the same time there is a royal battle among the rivals and the one who succeeds in stinging the other to death is left as reigning sovereign. The queens lay eggs in large numbers, placing in different cells those that are intended for workers, drones and new queens.

QUEEN BEE

WORKER

DRONE

The drones are males and are destroyed by the workers soon after the honey season. The workers do all the work of the hive. They gather the honey, bee-glue and pollen, which is made into bee-bread with which the young are fed. They clean the hive, form the wax, build the comb and care for the young. The formation of wax is very interesting. Some of the workers gorge themselves with honey and remain quiet for about twenty-four hours, after which the wax comes out as little plates from the wax pockets on the under surface of the body. About twenty-one pounds of honey are consumed to manufacture one pound of wax, but this amount will make about 35,000 honey-comb cells. The cells are six-sided; in building the same the workers begin at the top and build downwards, leaving some spaces for passage ways. Some of the cells are for honey, others for eggs.

The migration or swarming of the bees usually happens when the hive becomes too crowded. The first swarm, led by the old queen, usually starts out in June, leaving the new queen in possession of the hive. A second and third swarming sometimes take place. The swarm comes out, numbering thousands, and soon lights, usually on the limb of a tree, hanging like a bag, from which it may be taken and put into a hive.

"A swarm of bees in May
Is worth a load of hay.
A swarm of bees in June
Is worth a silver spoon.
But a swarm in July
Is not worth a fly."

Before swarming takes place there is no little commotion in the hive. The queen (or, better, mother) of a hive is an indispensable member, and beautifully cared for by the others. But between queen and queen there is little friendliness, and when a new queen comes forth from her cell the old queen knows her day is over, she must leave and go off to establish a new home. Warning of the flitting is given by both new queen and old. At the sound of the piping of the former a thrill passes through the hive, the queen giving special sign of agitation. Swarming takes place on a fine day, and may be considerably retarded by cloudy weather. Some of the new hives may be opened, an observer having opportunity to study the condition of the swarm and the progress of the work. Keepers often use little machines that puff smoke into the hives, this making the bees quiet without hurting them, and allowing the keeper to handle them. Bees become quite tame when handled often.

The sting is at the extreme end of the abdomen. The poison, pumped from the poison-sac with great rapidity, exudes from the many infinitesimal barbs of the dagger-like sting. The angry bee, leaving her sting behind in her victim, falls a victim, too, and shortly dies. A person stung should immediately remove the sting, which retains poison. The bee's tongue is a delicate and complicated instrument, which, when not in use, is folded back beneath its head; when active, working with lightning flash. For especially deep, tubular flowers there is an extra length of tongue that can be shot out from within. The tongue is hairy and there is a little, spoon-like termination. Some of the nectar taken up is eaten and digested; some stored in the honey-sac, situated in the big end of the abdomen. This and the pollen are taken home for the good of the community. Pollen accumulates in dust on the feathery hairs of legs and body, later to be collected in the two pollen baskets, one on the fourth joint of each hind leg. The worker gathers the pollen together with her legs, then scrapes it with one hind leg into the basket of the other leg. It is most interesting to watch her gathering pollen. "Sometimes she looks as if she were running about over a head of flowers to find something she had

lost—now this way and now that she goes in a great hurry, then turns around and around. But she has not lost anything, and she has not gone crazy; she is merely collecting pollen as fast as she can, and if you have sharp eyes you will see her rub, rub, rubbing it with her legs back into her baskets. It is astonishing how much she can carry. When her baskets are full, she goes about with a basket of pollen attached to each of her hind legs." (Morley).

The "busy bees" not only are carriers and honey-makers, but they sometimes stop to feed from their store a hungry relative. First the two cross antennæ by way of greeting, then the hungry one puts out its long tongue and proceeds to draw honey from the mouth of the other.

The senses of bees are very highly developed. The sense of vision is remarkable. The bee in proportion to its size has more eye-space than the owl, two great compound eyes and on top of its head three small eyes. No wonder it can make a bee-line for a desired goal. The antennæ or feelers are of the greatest importance; without them the bee is lost. They serve as nose and ears as well as feelers. Bees take the best of care of these sensitive things, cleaning them carefully and frequently.

The bee is very clean, as neat as can be; is always cleaning itself, making use of its legs, which answer well as comb and brush. The hive likewise is kept scrupulously clean. Fresh air is let into the crowded hive by an ingenious method; some bees standing outside fanning air into the holes in the bottom of the hive, others just inside doing their share of fanning, and good circulation is thus provided.

The bee has various enemies, and keeps sentinels on the lookout for intruders. There are robber bees to be combated; the bee moth to keep from gaining entrance and laying eggs that produce larvæ destructive to both comb and honey. Then there are birds that eat bees, and bears, notorious honey thieves, will eat both honey and honey-bee.

Bees are torpid during cold weather. The queen bee may deposit as many as 3,000 eggs a day. She sometimes lives four, sometimes five, years. The workers live but a few months at the most, sometimes only a few weeks. A hive has been known to yield 1,000 pounds of honey in a single season. As a rule, bees do most of their collecting within two miles of the hive. The common black or brown honey makers are German bees. The Italian bees, large bees with yellow markings on the abdomen, are in much favor in this country. The Carniolans, from Austria, have a good standing. The Syrians have the highest honey record. As is well known, white clover makes delicious honey; the flowers of the basswood are favored of bees; in the south, orange-blossoms are used and yield a clear, delicate strain. Buckwheat flowers give very dark honey. Bees sometimes gather flowers from poisonous plants, but that happens very seldom in this country. The wild bees store honey that both man and beast search for, the store being usually found in trees.

Before the world had sugar, honey was of great importance as an article of food. While not so highly valued to-day it is nevertheless much relished. Bees are of utmost importance in the cross-fertilization of plants; it is their habit to visit bloom after bloom of the same kind. Howard says: "Without their aid the health of the plant world would suffer and its infinite variety would hardly have been achieved." Attempts to raise fruit on a large scale with no bees in the locality have proved failures; abundant crops following the introduction of bees.

There are many kinds of bumblebees. They are large and furry. A familiar one wears a splendid coat of black and yellow. They are of much value in the fertilization of flowers, especially red clover. They generally nest in a hollow in the ground, under a tuft of grass, close to the surface. In the winter the queen lives quite alone, sleeping through the cold. When the flowers bloom again, she works very busily, gathering pollen to place in her nest and lay her eggs therein, where the young larva may help itself. After a time the larva spins a cocoon about itself, from which it comes forth a bee and, if a worker, ready to help carry pollen. As with the honey bee there are the three classes, workers, drones and queen; when cold weather comes, the workers and drones die.

See *The Honey Bee*, Frank Benton, *Bulletin No. 1*, United States Department of Agriculture; Hodge: *Nature Study and Life;* Morley: *The Bee People;* Howard: *The Insect Book.*

**Beech,** a genus of trees technically known as *Fagus*, represented by about five species in the cooler regions of the northern hemisphere. The species of the southern hemisphere formerly included under *Fagus* are now regarded as forming another genus. The beech is prized for its beauty, largely cultivated as a shade and ornamental tree, and valued for its timber and nuts. Both in Europe and the eastern United States the beech forms extensive forests, and it is the common hardwood tree of central Europe. It is a familiar and well-beloved tree of Europe; the beeches of England are famous and whole forests of beech are common in Denmark and Germany. In the olden days great herds of swine were fed on the beech-forests of England. The ancients highly prized beech-nuts for food, used the oil therefrom for lamps, kept their records on beechen boards—the word *book* being derived from the Anglo-Saxon word for this tree, *bece.*

# HOW HONEY COMB CELLS ARE MADE

Courtesy Technical World.

This picture of the little girl blowing soap bubbles illustrates the latest answer of science to one of Nature's oldest conundrums:

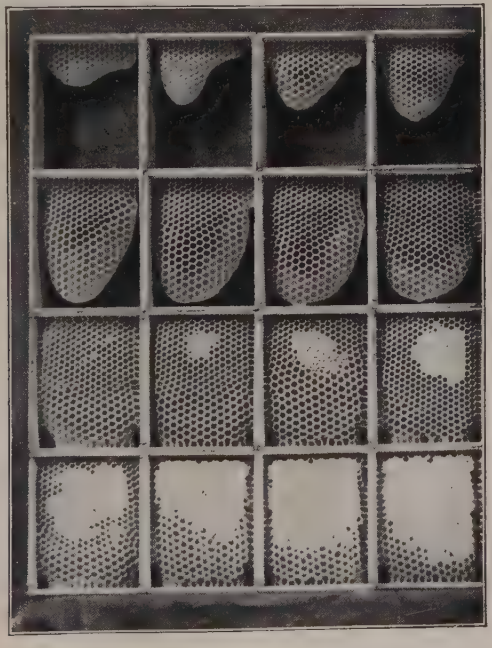
"Why are the cells of the honey comb six sided?" Look at the bubbles and see if you can't find this answer before I tell you.

Ever since King Mykennos of Egypt made his royal sign in sealing wax with the image of the bee in his ring—and long, long before that—men have kept and studied bees and spoken of their wonderful instinct in making their cells six-sided. Round cells waste space; six-sided cells make use of all the space and make the comb stronger because the cells support each other better.

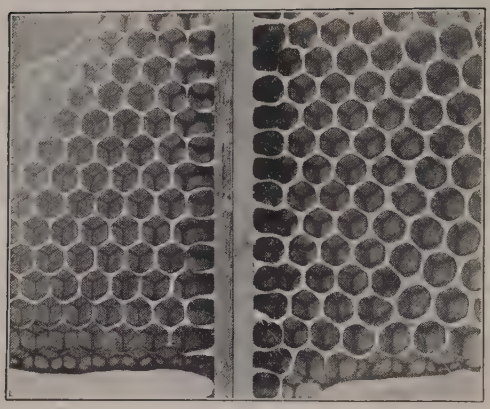
Now it is pointed out that the bees make the cells round in the first place; as you can see in the next picture they grow six-sided as the frames fill. So it is the pressure of the cells against each other that makes them six-sided, just as the pressure of the soap bubbles is changing them from round to six-sided figures. The soap bubbles do not take an equal sided shape because they are not strong enough and last too short a time.

A comb of 4000 cells is made in twenty-four hours. (How many cells an hour?)

After the breeding season the cells are built out longer and turned up at the end to keep the honey from spilling out until the cells are filled.

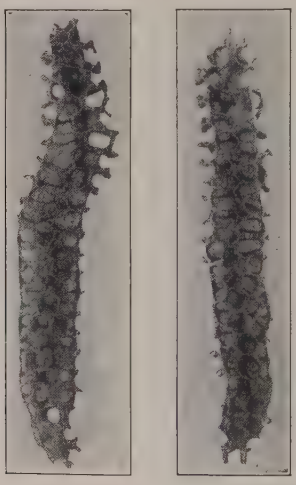


This picture shows the frames which are used in artificial hives. The bees begin to build the comb from the top of each section. When filled with honey, the bees seal the cells with wax. The frames are easily lifted from the hive at the convenience of the bee-keeper.



This picture shows how these cells will look under the microscope; and it shows something else. Notice that the point of meeting of the three sides of three cells is just opposite the center of the cell in the other side. Any carpenter, architect, mechanical engineer or your big brother in High School will tell you that this greatly increases the strength of the comb. You can see this back to back arrangement of a comb if you will hold one up to the light.

The queen bee reigns in the hive, and is treated with reverent courtesy and attention. When she moves about she is attended by a body guard, as seen in the picture. They form a circle about her with all their heads towards her. They walk backwards before her, and when they retire they move backwards, still facing their queen. They feed her with honey and bee-bread.



This picture shows that combs are not made only to hold honey, but to brace the little bee city—for that is just what a honeycomb is—so that it can't fall or be shaken down; as cities built by men sometimes are when they are shaken by earthquakes or struck by whirling winds.

If you ever find a beehive in the hollow of a tree, you will find these braces protecting it against the swaying of the trees in the wind. You will not find them in artificial hives.

When the workers go out into the fields for pollen to feed the babies, they carry along "market baskets." These baskets, as you see in this picture, are on the outside of each pair of hind legs. Both body and legs are covered with hairs which collect the pollen. The bees scrape the pollen off one leg with the other and put it into the basket. You have noticed the flies have the same habit. Bees do most of their collecting within two miles of the hive. The pollen is first rolled into a ball before it is dropped into the basket. The baskets are arched over with hairs to protect these little balls from falling out. Sometimes the bees roll in the flower so as to get themselves all covered with pollen—just as you have seen horses roll, or a bird flutter dust over himself.

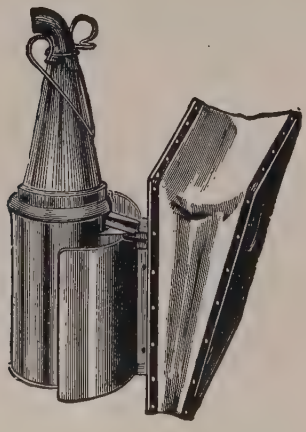
Bees' eggs are long shaped, about one-twelfth of an inch in length, are bluish white, and hatch in three days. The eggs hatch into little worm-like creatures, called larvae. They lie curled up in their cells as you curl up in bed on a cold night. They are fed by the workers for five days and then they refuse to eat and the workers seal up the cell—very much as you pull the bed clothes over your head and go to sleep. Then the bee that is to be spins himself a silk cocoon and is changed into a pupa—such as you see in this picture. About the first day after he becomes a pupa, he breaks from his cell a perfect little bee. All his aunts caress him and feed him just as other people do their babies. The next day, he tries his wings.

This picture gives an end view of a comb and shows how the honey is kept from spilling out before the cell is filled and sealed up; just as Mother seals her jelly glasses when they are ready for the winter storehouse. See how the bottoms of the cells are curved.

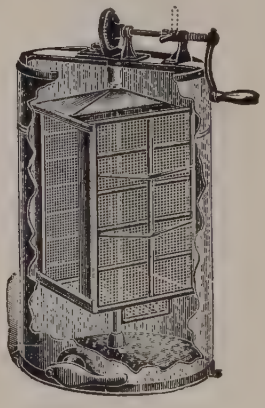
We see here the under side of the worker bee. This is magnified three times so as to show clearly the wax scales or pockets. When a swarm of bees begin to keep house in a new hive their first task is to manufacture wax out of which to make the comb. It is interesting to note what bees do and how they conduct themselves in making the wax. They eat all the honey they possibly can and then they remain quiet for about twenty-four hours. We do not know how the honey is changed into wax, but at the end of that time the wax appears in these wax pockets that you see in the picture. In the new hive the bees have suspended themselves from the top or roof of the hive and hang down like a curtain. When the scales have become filled with wax, they are ready for work and some of them run up to the top of the hive and lay the foundation of the comb. The making of the comb then proceeds rapidly. It takes about twenty-one pounds of honey to make one pound of wax, but this amount will make about 35,000 honeycomb cells. When first made the wax is of a white color; it turns brown with age.

## SWARMING

When so many bees are born that the hive becomes crowded, the inmates seem to come to an agreement to divide themselves up into two parties, one remaining in the old hive and the other starting out to secure a new home. This is called swarming. The new swarm must take the old queen with them. The queen is usually among the last to leave the hive. Sometimes she does not go at all and then the swarm returns to the hive after a time and try it again the next day The first swarms usually come out in June and sometimes a second, or even a third, swarm issues during the season. Usually after going a short distance the swarm alights on a bush or the limb of a tree, and here the bee keeper follows and the swarm is skillfully transferred to a hive. In the picture we see a large swarm which settled on a slender tree, bending it over by its weight.



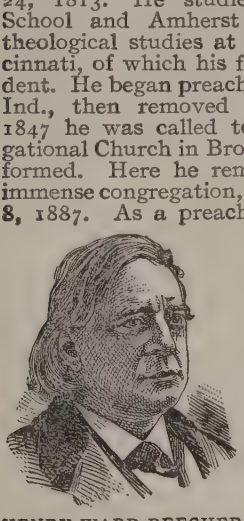
A SMOKER. This picture shows the tool which is used by men in getting the honey from the hive. We cannot drive bees from the hive, as we can drive cattle and horses with a whip. If you were to try it you would soon be driven off yourself by the angry bees, with their terrible sting. It is here that the power of smoke comes in. Blow a few puffs of smoke into a hive and it is astonishing to see the bees turn about and retreat in perfect dismay and fright. The above cut shows a picture of a device which is used for this purpose. In the can there is a little fire made with rotten wood or other material. The bellows forces the smoke through the mouth of the smoker into the hive. The bees soon become quiet and stupid and the comb can be handled without trouble.



A HONEY EXTRACTOR. The above is the picture of a honey extractor. The original honey extractor was invented by a major in the German army who saw his little boy swinging an unsealed comb in a basket on the end of a string. He swung it around his head and his father noticed that the honey oozed out. Then he made a machine such as you see in the picture which, when whirled very fast, forced the honey out of the comb, just as the cream separator separates the milk from the cream. After it is forced from the comb the honey drops to the bottom of the machine.

America has but one native beech, a tree of which we are justly proud. It is a round-topped tree; grows from 50 to 120 feet high; has abundant, thin, soft leaves, whose perfection is seldom lessened by insect attacks. The leaves are alternate, oblong-ovate, strongly veined. In autumn they turn yellow, remaining on the tree very late. The bark is of unique beauty, smooth, shining, bluish-gray, the limbs darker. The flower is inconspicuous. The fruit is a small, sweet, three-angled nut, the well known delicious little beech-nut. In Europe an oil made from the nut and called beech-oil, is extensively used for food; the nuts themselves are fed to swine, poultry, etc. The tree is widely distributed, its range being from Nova Scotia to Florida and westward. It grows best in sandy loam and limestone soil. Both Indians and early American settlers believed that a beech was never struck by lightning—a tradition that has its believers today. See Bailey: *Cyclopedia of American Horticulture;* Rogers: *The Tree Book;* Lounsberry: *A Guide to the Trees.*

**Beecher, Henry Ward,** a great American preacher and author, son of Dr. Lyman Beecher, was born at Litchfield, Conn., June 24, 1813. He studied at Boston Latin School and Amherst College, taking his theological studies at Lane Seminary, Cincinnati, of which his father was then president. He began preaching at Lawrenceburg, Ind., then removed to Indianapolis. In 1847 he was called to Plymouth Congregational Church in Brooklyn, which was just formed. Here he remained, attracting an immense congregation, until his death, March 8, 1887. As a preacher Mr. Beecher had great power. A rich voice, great vigor of action, a fine intellect, a warm sympathy for men of all classes and strong faith in God made him one of the greatest of pulpit orators. As writer, lecturer and orator he was hardly less gifted, his speeches and newspaper articles during the war producing a great effect both in his own country and in England. He wrote for many years for the *New York Independent,* and some of his articles were collected and published as *Star Papers.* He also founded the *Christian Union.* Among his published writings are *Lectures to Young Men, Life Thoughts, Norwood,* a novel, and a *Life of Christ.*



HENRY WARD BEECHER

**Beecher, Lyman,** a great American preacher and theologian, was born at New Haven, Conn., Oct. 12, 1775. He studied at New Haven, graduated at Yale College, studied theology for a year, and began preaching at East Hampton, Long Island, where he remained until 1810. He then went to Litchfield, Conn., where were born his two most famous children, Henry Ward and Harriet (Mrs. Stowe), though nearly all of his twelve children are well known. Here he soon made his mark as one of the first pulpit orators of the time, and preached his famous *Six Sermons on Intemperance,* at a time when the cause of temperance was very unpopular. After sixteen years he was called to Hanover Street Church, Boston, and during six years of hard work here he engaged in a theological discussion with Dr. Channing. Lane Theological Seminary at Cincinnati next called him to be its president. While here he was charged with heresy, tried and acquitted. He spent twenty years in the seminary, resigning when his health failed and spending the last ten years of his life in Brooklyn. He died Jan. 10, 1863, at the age of 88. He had many oddities. When excited by preaching, he used to divert himself by playing *Auld Lang Syne* on the fiddle, or dancing the double shuffle in his parlor. He also kept a pile of sand in his cellar, which he shoveled back and forth for exercise. His *Sermons* and his *Autobiography* have been edited by his son Charles.

LYMAN BEECHER

**Beer,** a fermented or worked liquor made from malted grain, usually barley, though wheat and, in India, rice are also used. There are various names to distinguish the different kinds of beer. Table beer, pale ale, mild ale and porter are names to mark slight differences in the process of fermentation or in the proportions of materials used. This drink has been known from the earliest times, the Egyptians using it 3,000 years before the Christian era. It is now the general drink of many nations. In making or brewing beer the first step is to soak or steep the barley in iron cisterns for a period from seventy-two to ninety-six hours, when the water is drained off and the barley thrown on to the malting floor, where it sprouts as it does when planted. This is called germination, and when it has gone far enough to produce the largest amount of sugar in the barley, the malt, as it is now called, is taken to the drying kiln. After drying, it is crushed,

and the crushed malt or grist is mixed with hot water in the mash-tub. Here an important change occurs, by which the starch in the barley is turned into grape-sugar. After a few hours the liquid, now called wort, is drained off and boiled with hops, which give beer its bitter taste, and help to keep it. It is strained, cooled and put into a large vessel, called a fermenting tun; yeast is added, and the fermentation goes on for several hours, when the beer is drawn off into casks and stored in cellars for use. This process is varied in different manufactories and for different kinds of beer, but the general method is the same. Among nations the Belgians use the most beer, consuming about thirty-six gallons for each person every year, though some single states in Germany use more—as Württemberg, where the average is forty or fifty gallons to a person. In the United States the amount used is about fourteen gallons to a person, and nearly 50,000,000 barrels are produced yearly, besides that which is imported. In the British Isles the consumption of beer annually is in the vicinity of 34,000,000 barrels, at a cost of $15 per barrel—an average expenditure per head of about $20, reckoning the present day population at a little over 43 millions. In Germany the consumption of malt liquor, exceeds that of Great Britain and that of the United States by about 30,000,000 gallons annually. In Austria-Hungary the yearly consumption is about 550,000,000 gallons; while Belgium consumes close upon 400,000,000 gallons.

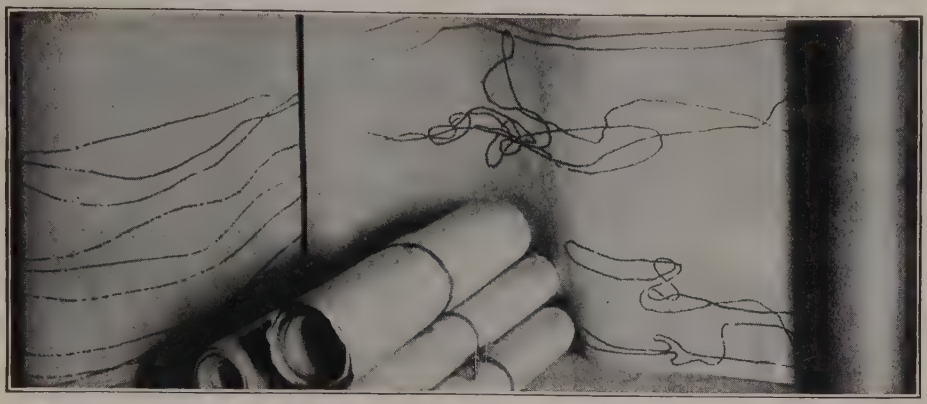
**Beersheba** (*bē-ēr'shē-bā*), now called Bir-es-Se-ba, a place on the southern border of Palestine, about fifty-two miles southwest of Jerusalem. The name means the "well of the oath," and it was so called because here Abraham made a covenant with Abimelech, the Philistine king and sealed it with an oath and a gift of lambs. In the 4th century A. D. it was a large village, with a Roman garrison. In the 14th century some churches were still standing there. Little is now left but a heap of ruins and two of its wells, which afford an abundant supply of pure water.

**Beethoven** (*bā'tō-ven*), **Ludwig Van,** a famous musician, was born at Bonn in 1770. A member of a musical family, he early showed evidences of his genius and at the age of four was taught to play the harpsichord, as the piano was then called. By the age of fourteen, when he became assistant court-organist he had already composed music and gained a reputation. He studied now under Mozart at Vienna and later under Haydn. He composed piece after piece with a wonderful rapidity and power. He was admired by many, and his career seemed to be one of great promise. But he became totally deaf, and from that time gave up society and shut himself up with his music and his books. His work went on, and kept growing in power and beauty. His compositions numbered 138, of which his symphonies and grand sonatas are alone said to be sufficient to make his name immortal. The ninth or *Choral Symphony* is held by many to be the most wonderful of all his compositions. Though from the standpoint of musical science his music is perfect, yet it is so human and full of feeling that it has ever had a strong hold upon all classes. He died at Vienna, March 26, 1827.

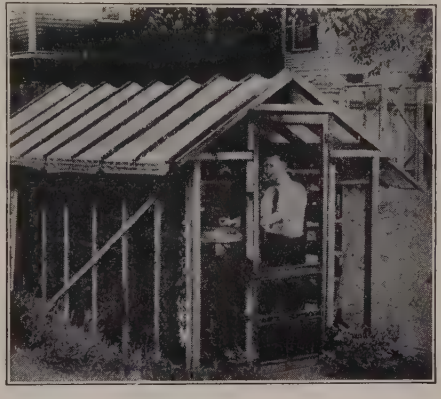
**Beetle,** the name of the largest order of insects. They have usually four wings, but the front pair forms hard and bony covers for those behind, which alone are used in flying. They have long legs and two strong jaws for gnawing. Their food varies from hard wood to soft fruits and the carcasses of animals. They live in the water and on land, under bark and stones and on plants, digging in the ground or drilling holes in wood. There are three changes which they undergo. They are first larvæ or grubs with wormlike bodies, horny heads and three pairs of legs. Then they enter the second or pupa state, sometimes lying for years in their cocoons or cases before becoming full beetles. There are about 100,000 different kinds, varying in form, color, size or habit. Of these more than 8,000 kinds are found in the United States. The tiger beetle is named from its striped body and fierce habits. It preys on caterpillars, flies and other beetles. The bombardier beetle shoots a strong liquid at its enemies; scavenger beetles live on filth, cleaning away a great deal. Of these, some are called carrion beetles, because they live on the dead bodies of animals, and others sexton beetles, as they bury the dead bodies of animals, and lay their eggs there, and the larvæ, when hatched, feed on them. The ordinary potato beetle and tumble bugs belong to this class. The latter roll balls of manure and push them along or carry them on their flat heads, and put them in deep holes after laying their eggs in them A related species was held sacred among the Egyptians. There are many blind beetles, these living in caves and under stones. Familiar beetles are the fire-fly, glow-worm and lady-bird and oil beetle. While certain species are highly useful, on the whole, beetles are pests, and the larval state lasts a number of years. They work destruction in crops, wood, lumber, fur, wool, hides, books, etc. The larvæ are generally called grubs. Of beetles' usefulness it may be said that many fertilize flowers; some destroy plant-eating insects, and of this species the lady-bird is an excellent illustration. Enemies of the beetle are birds, rodents, frogs, reptiles, flies, wasps, etc. See INSECTS.

**Beet-Sugar.** See SUGAR.

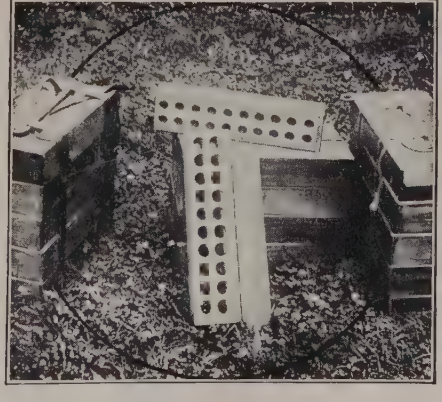
# A PIGMY FRIEND "WROTE" THIS



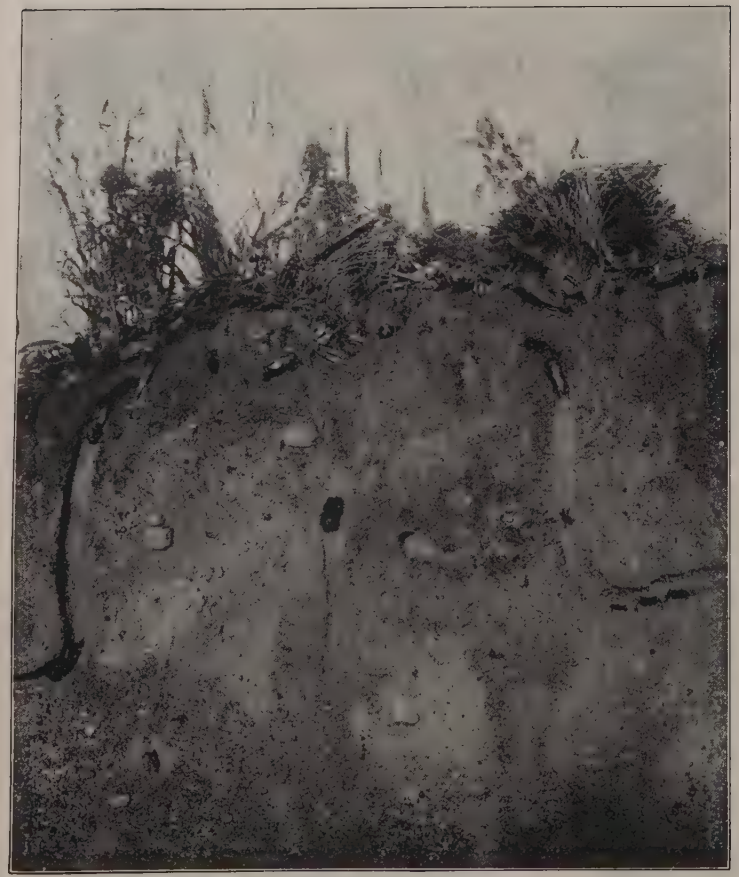
A beetle grub traveled 1¾ miles on these paper rolls. He was kept "inked" like a pen and so wrote his own record.



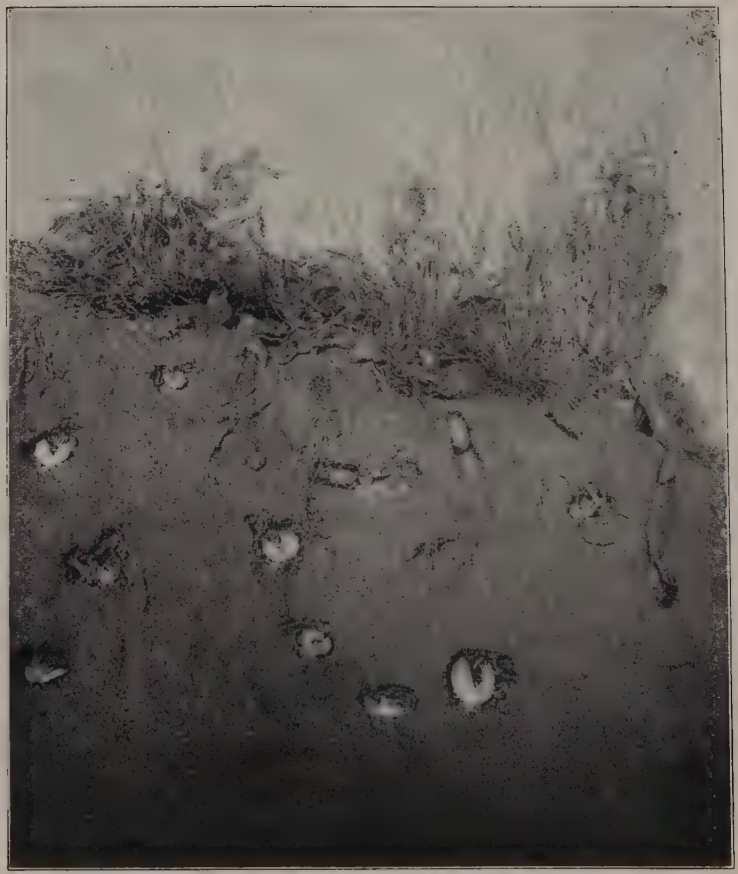
Such beetles are imported by our government because they live on destructive caterpillars, and the above record was made to learn how far they could travel in search of food. They were brought from Europe in these match boxes. On the right is a beetle breeding house.



The picture on the left shows glass jars of earth containing eggs of these beetles hatching in the sun; on the right, how beetles are carried into the field for planting colonies. Every hole is the house of a beetle.



NEST OF GRASSHOPPERS UNDERGROUND.



NEST OF BEETLES UNDERGROUND.

The eggs of these insects laid on the ground, hatch out into larvae or grubs which burrow in the ground, and when developed the insects crawl to the surface.

**Bego'nia,** a genus of tropical shrubs and herbs, perennial, succulent and often bearing handsome flowers, abounds in South America, Mexico and Central America. Some varieties of begonia are highly popular for the house and garden The roots are often bulbous, but sometimes fibrous. It is to be noted that the fibrous rooted begonia flowers in winter; the tuberous in summer. The begonia needs protection against excessive sun or drought; but is easily grown in the house or conservatory. An Asiatic variety, the *Rex Begonia,* is remarkable for its handsome foliage.

**Begums or Princesses of Oude, The.** The wife and mother of Sujah Dowlah, Nabob of Oude, who figured in the impeachment of Warren Hastings, England's great proconsul in India, and in Macaulay's great essay on him and his rule. In 1775 when the nabob died, the two princesses claimed that his hoarded treasure, amounting to two or three million pounds sterling, had been made over to them as their private property and could not be used as revenues of the state for the payment of tribute to the East India Company or for any other purpose. The new ruler, Asaph-ul-Dowlah, by dint of coaxing, had got his mother and grandmother to dole out some of the treasure. It was the remainder of it that Warren Hastings set his eyes upon, and, with the nabob's connivance, endeavored to wring from the princesses, with what success is seen in the impeachment and famous trial of Hastings.

**Bel'fast,** the second city in Ireland, capital of Ulster and headquarters of Presbyterianism in Ireland, is situated in the county of Antrim, in the northeast part of the island, on the Belfast Lough or Bay, twelve miles from the Irish Sea. Its population is 385,492. Several bridges cross the River Lagan, and a number of pleasant villas lie on either side of the bay. Picturesque hills to the north give the city a pleasant appearance, and much is constantly being done to improve it. Besides public buildings and churches, there are several colleges and schools, such as Queen's College, Belfast Academy and the national schools. The linen and shipbuilding trades are chief among those that give Belfast its prosperity, about five per cent. of the population being employed in the linen trade.

**Belgium** (*bĕl'jĭ-ŭm*), one of the smaller European states, lying between France and the Netherlands, the North Sea and Rhenish Prussia. It is divided into nine provinces, and comprises 11,373 square miles, less than one third the size of Indiana. It has a population of 7,160,547, or 629 persons to the square mile, so that Belgium is the most densely populated country in Europe. Dutch, Germans, French, Flemings and Walloons are found among its population. There are twenty-six towns with over 20,000 inhabitants, of which the capital, Brussels (population, 612,401), Antwerp (297,311). Ghent (163,059) and Liege (122,207) are the largest. Most of the country is low, and part of it is protected from the sea by dykes. The Scheldt and the Meuse, with their branches, and a system of canals afford abundant water supply. The farming is like gardening on a large scale, so carefully is every inch of soil cultivated. All kinds of grain are raised. The land is rich in minerals, including coal, iron, lead, copper, zinc and marble The chief manufactures are linen, woolen, cotton and silk goods, lace, leather and metals, besides sugar-refineries and distilleries, steel works, blast and puddling furnaces.

For many years Belgium led Europe in commerce, and her foreign trade is still very large. The people are mainly Roman Catholic. Culture has been hindered somewhat by the many different dialects in use; but there are many scientific and literary societies and museums, public libraries, music and art schools and universities at Ghent, Louvain, Liege and Brussels. Attached to the universities are schools of engineering, arts, manufactures, mining, etc., with a combined attendance in 1909–10 of 2,407 students. There are also 85 schools of design, with nearly 15,000 students, several royal conservatories and other schools of music with 20,192 students, beside the Royal Academy of Fine Arts at Antwerp, with 850 students in 1909. Belgium numbers Rubens, Teniers and Van Dyck among its great artists.

The standing army is fixed at 42,800 in time of peace, with 180,000 on a war-footing. Belgium has no navy. The government is a constitutional monarchy, in which the succession is hereditary There are two houses, much like those in the United States —a senate (having 110 members), elected for eight years, and a chamber of representatives (present number being 166), elected for four years.

The history of Belgium as a separate kingdom dates from the year 1831, when it parted from Holland Its provinces, however, have figured in history from the days of the Cæsars. They often served as the battle-ground of Europe, and the battle of Waterloo was fought on the soil of Brabant, a province of this kingdom. When Belgium became independent, Prince Leopold of Saxe-Coburg was elected king, and in 1865 his son, the present monarch, succeeded as Leopold II. War with Holland has several times threatened, and riots of workingmen and socialists have caused disturbance; but the country is steadily growing in prosperity. The revenue estimated for 1911 amounted to 658,724,000 francs, while the expenditure, as per budget, was a fraction over 658,000,000 francs. The imports for 1910 showed a

total of over 6,500 000,000 francs. The exports from the United States to Belgium, consisting of wheat, cotton, oil-cake, mineral oil, lard and tobacco, were valued in 1911 at $45,016,622, while the imports from Belgium into the United States, consisting of glass-work, rubber goods, iron and steel work and jewelry, had a gross value of $37,084,743. The railways of Belgium in 1911, including the lines operated by the state and those operated by private companies, were 2,915 miles in length.

**Belgrade** (*bel'grad*), meaning "white town," is the capital of Servia and lies at the junction of the Save and the Danube, with a population of 90,890. From a Turkish city it is year by year becoming a modern and European one. The royal palace and the national theater are the chief buildings. Opposite the theater is a bronze statue of the murdered Prince Michael III. It is important from the trade of Turkey and Austria which passes through it. Belgrade has been the scene of many hard fights, and has been successively in the hands of Romans, Greeks, Hungarians, Bulgarians, Servians, Turks, Austrians and French. It was made the capital of Servia in 1862, but the citadel was not given up by the Turks until 1867. Elementary education in the city and state is compulsory, and in all the schools under the ministry of education, including the university, education is free. Hence there is little pauperism in the kingdom. Belgrade also forms a department of Servia, area 782 square miles; population, 155,815.

**Belisarius,** a Byzantine general, was born about 505 and died in 565, the same year as his emperor, Justinian the Great. From the emperor's body-guard he rose to the chief command in the army. The wisdom of Justinian's appointment was apparent, for Belisarius with Narses helped to restore to the Roman Empire part of its lost possessions. In 530 he defeated the Persians, and in 532, when civil disturbances threatened to disrupt the empire and displace the emperor, Belisarius was recalled and with a body of followers restored order. After this he conquered the Vandals, invaded Italy in 548, conquered the Bulgarians in 559 and upon his return to Constantinople was accused of conspiracy. Justinian believed him innocent, however, and restored his rights and property of which he had been deprived. Many narratives are related of Belisarius, as that the emperor had his eyes plucked out and he became a street beggar, others of his imprisonment in a tower, etc. These legends are not credited, since no contemporary writer relates any of them.

**Belize** (*be-lēz'*) or **British Honduras,** a British colony on the Bay of Honduras, in the Caribbean Sea. It forms the southeast part of the Peninsula of Yucatan, and covers 7,562 square miles. The population is 40,458, only 500 being whites. The Cockscomb Mountains (4,000 feet) are the highest elevations, the land along the coast being swampy. The chief exports are mahogany, log-wood, sugar, coffee, cotton, cocoanuts, bananas, and india-rubber. Since 1862 it has been a British colony, and in 1903 the Bank of British Honduras was established at Belize, population 10,478.

**Belknap, George Eugene,** American naval officer, born in Newport, N H., January 22, 1832. He received appointment as midshipman in the navy in 1852, and was successively lieutenant-commander, commander, captain, commodore and rear admiral. He was present in China in 1856 at the taking of the Barrier Forts, and in the Civil War took part in the bombardment of Charleston Harbor. He achieved distinction while engaged in deep-sea sounding in 1873. While thus engaged in the north Pacific Ocean, he made discoveries relating to the topography of the ocean bed, which attracted the scientific world. He published, among other works, *Deep Sea Soundings*, and in 1885 was appointed superintendent of the United States Naval Observatory. He was retired in 1894, and died April 7, 1903, at Key West, Florida.

**Bell.** From the earliest times bells of some sort have been in use. For their manufacture, the material most approved in all ages has been a mixture of copper and tin called bronze; but the proportions of the two metals vary. For a long time in Europe, two parts of copper to one of tin were considered the best ratio, but at present much more copper is used, the ratio being about thirteen parts to four. Steel, silver and glass have also been used for bells, but are not as good as bronze. With any metal the pitch of the bell depends upon the ratio between the thickness of the striking-place and the diameter. Bells were used among many early nations in religious ceremonies, and so came naturally into use in Christian churches. From Italy their use spread over Europe between the 6th and 12th centuries. Most of these bells were hand-bells, made of thin plates of hammered iron, bent into a four-sided shape, fastened with rivets and bronzed. One of these early bells, called The Bell of Patrick's Will, is still preserved at Belfast. When bells came to be hung in steeples or belfries, they were at first small; but were gradually made larger; the largest bell in the world was cast in 1734. It is called the Great Bell or Monarch of Moscow. It is over 21 feet in height and diameter, and weighs 193 tons. It fell down during a fire in 1737, was injured, and remained unrestored until 1837, when it was raised and now forms the dome of a chapel made

by digging out the space beneath it. Other large bells are the Great Bell of Pekin (53½ tons), and the *Kaiserglocke* of Cologne cathedral (26 tons), made out of 22 French cannon. The largest bell in the New World is in the cathedral of Nôtre Dame at Montreal (29,400 lbs.). Many early superstitions have gathered around bells; they were believed to drive away storms and pestilence and to put out fire. From religious customs connected with them bells have acquired a sacred character. At one time they were tolled when any great personage was passing out of the world, and they are now often tolled after deaths and before funerals. The ave bell, sanctus bell and vesper bell are among those used in the Roman Catholic church. The curfew bell was rung to warn people to put out their fires and lights at eight o'clock in the evening, and this eight o'clock bell is still rung in many parts of England and Scotland Many churches now have peals or chimes, on which tunes are played. Tune-playing bells are sometimes sounded by means of a cylinder, just as a barrel organ; others are played with keys by a musician. The best chimes consist of from eight to twelve bells. The muffled peal, which gives one of the finest effects, is rung with a leather cap over half the clapper, making the chimes first clear and then dull. In casting bells, the core or part which fills the inside of the bell is first made of brickwork covered with soft clay; then the outer mold or cope is fashioned in the form of the outer surface of the bell and fitted over the core, leaving a hole in the top for the escape of the air. The melted metal is then poured in. Electric bells have of recent years been extensively used in offices and houses. See ELECTRICITY.

**Bell, Alexander Graham,** one of the inventors of the telephone, was born at Edinburgh in 1847, was educated at the High School and in Germany, and in 1872 introduced into the United States the system of deaf-mute instruction which his father had invented. Having for some time experimented on the transmission of sound by electricity, he exhibited his telephone at Philadelphia in 1876, and its success from that time on was assured. He has also invented the radiophone. Since 1881 he has lived in Washington. Considered as the inventor of the telephone, Bell's great merit lies in the fact that he, at the same time with Elisha Gray, recognized that human speech cannot be transmitted by means of an intermittent current, but *requires an undulating current.*

ALEXANDER GRAHAM BELL

Bell saw that an intermittent current might reproduce the pitch and amplitude of a sound, but without a continuous current one could not reproduce the quality of the sound.

**Bell, Henry** (1767–1830), a Scottish engineer, born in Linlithgowshire, who served his apprenticeship to his uncle, a millwright, but later became interested in ship-modelling under John Rennie of London, the notable civil engineer. Returning to Helensburgh, on the Clyde, in 1808, he pursued his experiment with the steam engine and achieved fame by constructing and sailing on the Clyde the steamship *Comet*, the herald of steam navigation in the Old World. Fulton, it is asserted, gained his ideas of steam navigation on water highways from Bell.

**Bell, Henry Haywood** (1808–68), American rear-admiral, was born in North Carolina and in 1823 entered the United States Navy as midshipman. He early saw service in China and in 1856 was in command at the attack on the Barrier Forts, at Canton. In 1862, during the War of the Rebellion, he acted as fleet captain of the West Gulf Squadron and led a division of gunboats in the attack upon Forts St. Philip and Jackson, part of the defences of New Orleans. In the following year, he took command of the blockading squadron during the temporary absence of Admiral Farragut. In 1865 he was in command of an United States Squadron operating in the East Indies, and two years later met his death by drowning in an attempt to pass in his barge over the bar at the mouth of Osaka River, Japan.

**Bell, John,** a notable Tennessee publicist, speaker of Congress and founder of the Whig party, was born near Nashville, Tenn., in 1797, and died at Cumberland Iron Works, Tenn., September 10, 1869. Graduating in 1814 from the University of Nashville, he studied law, and in 1817 became a senator for his state. From 1827 to 1841 he served in Congress, and for a year was speaker of the house. In 1841 he became secretary of war in President Harrison's cabinet, but resigned the office when President Tyler abandoned the Whig party. After some years of retirement, he from 1847 to 1859 was United States senator, and in 1860 became candidate of the Constitutional Union party for president. He took no part in the Civil War, as he condemned secession, though he abjured coercion

**Bell, Robert,** I.S.O., D.Sc., M.D, C.M, F.G.S., F.R.S.C., F.R.S., was born in Toronto, June 3, 1841, and educated at McGill

University, where he was graduated in science, medicine and surgery, later studying chemistry in Montreal and under Lord Playfair at Edinburgh. He joined the geological survey of Canada in 1857, and has ever since been engaged in extensive topographical and geological surveys throughout the Dominion, Bell River being officially named after him. He has been royal commissioner on the mineral resources of Ontario, 1888–9, a member of the American Institute of Mining Engineers, member of the government geographical board, professor of chemistry and natural science in Queen's University, Kingston, from 1863 to 1867, and is honorary chief of the Algonkin Indians of Grand Lake. His published writings aggregate two hundred titles, including geology, geography, biology and folk-lore.

**Bellaire** (*bĕl-lâr'*), a city in Belmont County, Ohio, on the Ohio River, five miles south of Wheeling, West Virginia. The region around Bellaire abounds in coal, iron, limestone, cement and brick clay. The city has manufactories of stoves, carriages, glass, foundry and machine-shop products. Bellaire has all the improvements of a progressive city. Population, 13,896.

**Bell'amy, Edward,** American economist, journalist and story writer, was born in Massachusetts, Mar. 26, 1850, and died there May 22, 1898. Entering journalism as a profession, he was for a time on the staff of the *New York Evening Post* and later was editorial writer and critic for the Springfield *Union*. Owing to poor health, he made a voyage in 1876 to the Sandwich Islands, and after this began to write short stories for the magazines. His chief success, however, was his socialistic novel, *Looking Backward*, which, issued in 1888, had a sale of over 300,000 copies in this country. Inspired by the book, "Bellamy" communities became for a time the vogue. His later works embrace *Equality*, *The Blind Man's World* and other stories.

**Bellefon'taine, Ohio,** a city, the county seat of Logan County on the Cleveland, Cincinnati, Chicago and St. Louis and the Toledo and Ohio Central railroad, 30 miles north of Springfield and 45 northwest of Columbus. Besides a large railway plant and carshops, the city, which dates from 1818, has a number of manufactures of iron bridges, carriage bodies, tools, harness, etc., besides the city's gas, electric-plant and water-works. It has also a flour-mill. It has a number of churches and several good schools. Population, 8,238.

**Belleville, Ill.,** county-seat of St. Clair County, southwestern Illinois, 14 miles southeast of St. Louis, is beautifully situated in the midst of rolling and somewhat broken country. It has good railroad connections and has nearby shipping facilities furnished by the Mississippi. It has fifteen large foundries, extensive brick works, factories for the manufacture of farm implements, breweries, hosiery mills and two shoe factories. It possesses some fine civic buildings, good public schools, many churches, a large convent and handsome residences. It has 25 miles of paved streets. Population, 25,000.

**Belleville** is a manufacturing city of 9,117 souls, admirably placed on the north shore of the Bay of Quinté and on the Grand Trunk Railway. It is the county seat of Hastings County, Ontario, the southern terminal of the Midland Railway, and is touched by a line of lake steamers on Lake Ontario.

**Bellevue, Ky.,** a city, in Campbell County, on the Ohio River, opposite Cincinnati, and on the Chesapeake & Ohio Railroad. Settled in 1871, it was incorporated in 1871. An attractive residential suburb of Cincinnati, it is connected with the latter by electric railway. Population is now 6,683.

**Bellicent.** In the Arthurian legends Bellicent is represented as the daughter of Gorlois and Ygerne and the half-sister of King Arthur. She was the wife of Lot, King of Orkney. When King Lodogran hesitated to give his daughter Guinevere to King Arthur in marriage because of the doubts about Arthur's parentage, Bellicent won his consent to the marriage. See Tennyson's *Idylls of the King*.

**Bell'ingham, Wash.,** a city in Whatcom County, on Puget Sound and on the Canadian Pacific, C. M. & St. Paul, Great Northern and the Northern Pacific railroads, 70 miles north of Seattle, west of Mount Baker and near the British Columbia boundary. It has a fine land-locked harbor, an inlet of the Strait of Georgia, and has communication by steamer not only with Seattle, but with San Francisco and the nearby city of Victoria the capital of British Columbia. Besides its shipping trade, chiefly in lumber, it has a large number of shingle and saw mills and several large salmon canneries. Population, 36,890.

**Bellini** (*bĕl-lē'nē*), **Vincenzo,** a composer of operas, was born at Castania, in Sicily, in 1802, and was the son of an organist. He was sent to the conservatory of Naples, where he studied composition. After a number of early operas had made him known in Italy, he wrote, in 1827, the opera *Il Pirata*, which gave him a name in the musical world. For the next eight years he wrote a fresh opera almost every year, and visited Paris and London. When only thirty-two years old, and before his powers were fully developed, he died near Paris, Sept. 21, 1835. Among his best works are *Norma*, *I Puritani* and *La Sonnambula*. His operas are replete with sweet melodies.

**Beloit** (*bĕ-loit'*), a city of Rock County, Wisconsin, situated on Rock River, ninety-

# St. Peter's

## Where the Pope Holds Service

ST. PETER'S, where the Pope holds service, is the world's largest and most magnificent church. It stands on the right of the Tiber near the Vatican in a space in the form of an ellipse. From it extend the huge colonnades or covered drives which you see. The dome of the capitol at Washington is copied from the dome of St. Peter's, the erection of which was supervised by Michelangelo.

Now imagine yourself in this wonderful building looking at the group by the famous Spanish painter, Mas y Fondevila, "Worshippers at St. Peter's." With what skill the artist has brought out the lights and shadows in this vast palace of religion and art and emphasized the motherhood of the church which knows no distinction of rank or class. What a variety of figures and attitudes—the young Italian mother with her babe, one old man with his head bowed upon his cane, another, rheumatic and in ragged shoes holding to the chair to prevent himself from falling, as he bows in worship.

Worshippers in St. Peter's, by Arcadio Mas y Fondevila (Spanish b. 1850)

POPE BENEDICT XV

two miles northwest of Chicago. It is a handsome town, built on the bluffs overlooking the river, and has a well-laid-out park. Among its manufactures are paper-mill and wood-working machinery, steam-pumps, gas and gasoline engines, agricultural implements, shoes, hosiery and paper. The river furnishes excellent power for manufacturing, and Beloit has the service of two railroads. It is the seat of Beloit College, a well-equipped and endowed institution with a faculty of thirty. Population, 15,125.

**Belt of Calms,** a narrow zone where the winds are weak and irregular, often dying into a calm. It lies along the line of greatest heat around the globe, and shifts north or south with it. The northeast tradewinds are north of the belt, the southeast ones south. In this belt the tradewinds become hottest and lightest.

**Belt of Heat,** the regions on and near the equator, where the air is hot all the year, because at noon every day the rays of the sun strike straight down or nearly so. The slant of the sunshine varies but little. Day and night always are each about twelve hours long. The change of seasons is slight, and there is no winter.

**Beluchistan** See BALUCHISTAN

**Bel'videre, Ill.,** a city, the county seat of Boone County, on the Kishwaukee River, and on the Chicago & Northwestern Railroad, about 75 miles west-northwest of Chicago. It is an active industrial center, and is situated in a fine fertile region with large dairying interests. It has a number of fine municipal buildings, besides an opera house, a public library, good schools and church edifices. Its industrial establishments embrace automobiles, bicycles, sewing machines, boilers, screen doors, flour-mills, etc. Its water-works are owned and operated by the city. Population (1910), 7,253.

**Benares** (*bĕn-ä'rĕz*), the most sacred city of the Hindus. Sacred bulls wander among its 1,450 Hindu temples and shrines and 272 Mohammedan mosques, pilgrims bathe in the Sacred Well, or Pool of Knowledge, and the Hindu dead are cremated in the Burning Ghat. The broad flights of stairs leading to the temples, standing on the high banks of the crescent sweep of the Ganges, present a view of striking beauty. The chief industries are the manufacture of muslins and silk shawls. Population 209,300, of whom 160,000 are Hindus.

**Benedict XV.** was elected on September 3, 1914, as successor to Pope Pius X. He is the son of the Marchese della Chiesa, and at the time of his election was Cardinal Giacomo della Chiesa, Archbishop of Bologna. He is a comparatively young man for so responsible an office. He was born at Pegli, Italy, November 21, 1854. Like his predecessor His Holiness is a man of unusual intellectual force and activity. His first public utterance was an appeal to the Roman Catholics throughout the world and to the peoples of Europe to pray and work for the end of the Great War.

**Bengal** (*bĕn-gal'*), the most important of the seven great provinces of British India. It lies in the west of India, between the Himalayas on the north and the Bay of Bengal on the southeast. It is nearly as large as Spain, and its population is about 52,668,000, or nearly that of the population of the United States. Its capital is Calcutta. Eastern Bengal and Assam have, besides Bengal proper, an area of 106,130 square miles with a population of 30,961,459.

*Political Divisions and Cities.* It is divided into nine large provinces, each under a commissioner, while these are again divided into forty-six districts, each with a magistrate. Besides Calcutta there are few large cities; though there are over thirty towns, each with upwards of 20,000 inhabitants. There are about 2,000 miles of railway and 5,110 miles of telegraph line.

*Climate.* The climate is generally hot and damp, and the rainfall in Chera Punji is the greatest reported in the world. Destructive cyclones and floods are frequent, earthquakes are not unknown, and famine, unhappily, is occasionally rife.

*Natural Resources.* The land contains a good deal of mineral wealth, especially coal, iron and copper. On the seacoast are the trackless forests, which are the home of the tiger and the rhinoceros. The land is very rich, owing to the dressing of soil brought down every year by the immense network of rivers, the largest of which are the Ganges and the Brahmaputra.

*Occupations.* Agriculture is the main occupation of the people, and among the products are indigo; jute, from which certain cloths are made; cinchona, from whose bark quinine is made; the opium poppy, varieties of rice; grains, spices, cotton, sugar and drugs. The yearly exports amount in value to about $200,000,000.

*Education.* Bengal stands far ahead of the rest of India in its provision for education. There are five colleges, connected with the University of Calcutta, and a fine system of public and private schools and special schools. Calcutta, including its suburbs has a population of 1,222,313. (For history see INDIA.)

**Bengali,** a modern East Indian dialect, with a literature; it is akin to Hindustani and is spoken by nearly 45 millions of natives in the presidencies and chief provinces of British India. With Hindustani, it is

the language commonly heard in Calcutta and the Valley of the Ganges. It is related to Sanskrit, which has had an influence upon its inflexion and syntax, like other languages of the Aryan family. Its literature embodies translations of the chief Sanskrit epics, notably the *Mahabharata* and the *Ramayana*. See Dutt's *Literature of Bengal*; also dictionaries of Bengali, Sanskrit and English.

**Benghazi.** See BARCA.

**Benguela** (*běn-gā'lă*), a district and port in Angola, a colonial possession of Portugal on the west coast of Africa. It lies south of French Congo, and southward also from Sao Paulo de Loanda, the capital town of the district. Its trade is mainly with Portugal, its chief exports being coffee and rubber. Malachite, copper and iron, together with petroleum and salt, are found in the province. Its soil is fertile and produces a luxuriant vegetation; but the climate, especially near the coast, is hot, humid and unhealthy. Besides the shipping trade in the coast towns, the province of Angola has now considerable railway traffic inland, with 250 miles of railway in operation. From Lobito Bay near Benguela a 1,200-mile railway is being built to connect in Northern Rhodesia with the Cape-to-Cairo road.

**Ben'jamin,** meaning "son of the right hand," was the youngest and best beloved of the sons of Jacob. He was at first named Benoni by his mother Rachel, but after her death the father changed the name to Benjamin. He was the founder of one of the two tribes of Israel whose warriors were noted for their skill in archery and for their cleverness with the left hand. On entering Canaan the tribe numbered 45,600 warriors above twenty years old. The territory of the tribe lay on the west side of the Jordan, between the tribes of Ephraim and Judah. Saul, the first king of Israel, was a Benjamite. After the death of Solomon, Benjamin along with Judah formed the kingdom of Judah, and on the return from the captivity these two tribes formed the main element of the new Jewish nation. The Apostle Paul belonged to the tribe of Benjamin.

**Benjamin, Judah Peter,** an American lawyer and politician, was born in 1811 in the West Indies, of Jewish parents, who at a later day emigrated to the United States. He practiced law in New Orleans and became interested in politics, acting first with the Whigs. He was elected United States senator from Louisiana in 1852, and on the slavery question sided with the Democrats. When Louisiana seceded, he withdrew from the senate and became a member of Jefferson Davis's cabinet as attorney-general. He was later secretary of war and then secretary of state until the downfall of the Confederacy. He then went to London, where he was called to the English bar and practiced with success until 1881, when he retired. He died in Paris, May 6, 1884. He published a treatise on the *Law of Sale of Personal Property*.

**Ben'nett, James Gordon,** founder and proprietor of the *New York Herald*, was born in Scotland in 1795, and studied to be a Roman Catholic priest, but, abandoning that idea, emigrated to America in 1819. For a livelihood, he tried teaching, proofreading, writing and lecturing, and was connected with several newspapers, but remained a poor man, when in May, 1835, he issued the first number of the *New York Herald*. By his industry and sagacity he made the paper a great success, and soon became a wealthy man. His paper was the first one to publish the stock lists and a daily money article, and many other original features were afterwards added. When steam communication was opened with Europe, he crossed the Atlantic and made arrangements for correspondence from all countries. The first speech ever reported in full by the telegraph was sent to the *Herald*. The paper was independent in politics, but generally supported the Democratic party. He died in New York, June 2, 1872, in the Roman Catholic faith. He bequeathed the *Herald* to his son, James Gordon Bennett, who is now its editor and proprietor. The present editor, together with the *London Daily Telegraph*, supplied the funds for Stanley's journey across Africa (1874–7) from Zanzibar to Lakes Victoria and Tanganyika and down the Congo to the Atlantic.

**Ben Nevis** (*běn nĕv'ĭs*), a mountain of Invernessshire, Scotland. One of the loftiest peaks in Great Britain, it has a height of 4,400 feet, with a precipice of 1,500 feet on the northeast side. A road was built to the summit in 1883, where a weather observatory has been erected. A weather report is sent daily from this elevation and transmitted by telegraph over Scotland.

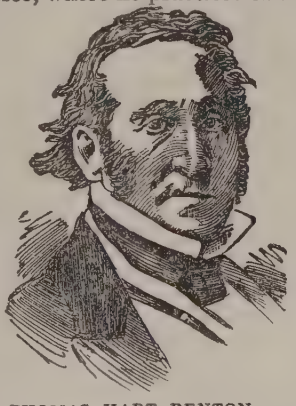
**Ben'nington,** capital of the county of the same name in Vermont. The place is famous because of the battle fought there in the Revolutionary War. On Aug. 16, 1777, Gen. Stark, at the head of a column of Green Mountain Boys, defeated a force commanded by Col. Baum, sent from Gen. Burgoyne's army to capture the public stores at Bennington. Six hundred British prisoners were captured. In 1891 a monument commemorating this event was dedicated; it is a shaft 301 feet in height. The anniversary of this battle has been celebrated almost every year since, and in 1877 a centennial celebration was held, at which the then president of the United States and his cabinet, the governors and legislatures of Massachusetts, New Hampshire and Vermont, besides many prominent men of the army and navy and of other

states, were present There are valuable deposits of brown hematite ore in the town and also considerable manufacturing, including knit goods, woolen goods and machinery. Population 8,698.

**Benson, Arch'bishop Edward White,** an English prelate and primate of all England (1882–96), was born in 1829 and died in Flintshire, Wales. After graduating at Trinity College, Cambridge, he taught for a while at Rugby, was head master of Wellington College, chancellor of Lincoln Cathedral, and in 1877 was consecrated Bishop of Truro. In 1882, on the recommendation of Mr. Gladstone, the Crown appointed him as successor to Dr. Tait in the Archbishopric of Canterbury. He held this high office in the church until his death October 10, 1896. Dr. Benson wrote several religious works and sermons, including *The Seven Gifts, Christ and His Times* and *The Cathedral: its Necessary Place in the Life and Work of the Church.*

**Benson, Maj.-Gen. Frederick William,** son of the late Hon. J. R. Benson, senator of Canada, was born at St. Catharine's, Ont., August 2, 1849, and educated at Upper Canada College and at the Royal Military College at Sandhurst. He served as a volunteer during the Fenian raids of 1866, joined the 21st Hussars in 1869, has since seen much service in India, Egypt and South Africa, and has been director of transports and remounts since 1903.

**Ben'ton, Thomas Hart,** an American statesman and writer, was born in North Carolina, March 14, 1782. He subsequently moved to Tennessee, where he practiced law and served in the state legislature. After the War of 1812, in which he took part, he removed to St. Louis and there edited the *Missouri Inquirer.* In 1820 he was elected to the United States senate, where he served for thirty years, taking a strong stand on the questions which were then agitating the country. Because of his earnest support of President Jackson in his war on the United States Bank, he earned the name of Old Bullion. He opposed the compromise measures of 1850, and Calhoun's measures intended to provide for the extension of slavery. His stand on the latter measure lost him his seat in the senate. In 1852 he was elected to the house of representatives; but two years later he was defeated as a candidate for re-election, and devoted the remainder of his life to literary work. He published *Thirty Years' View or A History of the Working of the American Government from 1820 to 1857.* He also abridged the Debates of Congress from 1789 to 1856. He died at Washington, April 10, 1858.



THOMAS HART BENTON

**Benton Harbor, Mich.,** a city in Berrien County, on the St. Joseph River and on the Pere Marquette, the Cleveland, Cincinnati, Chicago & St. Louis and other railroads. It lies back one and one half miles from Lake Michigan, but is connected with it and its fine harbor by a ship canal, and from the harbor steamboat lines ply to Chicago, Milwaukee and other ports on the lake. It has a considerable trade in the product of the important mineral springs adjoining the city; while it also ships largely of flour, furniture, machinery, besides fruit, beet-sugar, pickles, cider and vinegar. Population, 11,000.

**Be'owulf,** a long and notable Anglo-Saxon poem of the 8th or 9th century, now among the treasures of the British Museum, in London. The poem or epic, it is thought by scholars, existed prior to the colonization of Britain by the Anglo-Saxons, and was probably brought to Britain by the early Teutonic invaders. Its hero is represented as a thane and, later, as a king of the Swedes, while the field of action is in Swedish and Danish territory.

**Beranger** (*bā'rän'zhā'*), **Pierre Jean de,** a great song writer of France, was born in Paris, August 19, 1780. He was brought up by his grandfather, a tutor, and later by his aunt, an innkeeper, who filled him with republican ideas. After a few years of work as a printer, he retired to a Paris garret, where he gave himself to literature and study But poverty soon again forced him into the world. He received aid from Lucien Bonaparte, and three years later was made a clerk in the Imperial University. In 1815 he published his first collection of songs, which made him the poetic champion of the masses who opposed the Bourbons. He wrote always for the working classes, for whom he had a deep sympathy, and he was so popular among them that his verses were repeated from mouth to mouth before they were printed, so that it has been said that he is the only poet since printing was invented who did not need its service. In 1821 two volumes of poems which he published were so strongly republican in sentiment that he was brought to trial, fined 500 francs and sentenced to three months in prison; and in 1825 another set of songs caused him to be again imprisoned. While in prison he was visited by the great literary men of the day, including Victor Hugo, Dumas and Sainte-Beuve. In 1848 he was elected by more than 200,000 voters to

represent the department of the Seine in the constituent assembly, but after a few days he resigned and retired to his quiet work and study, where he remained until his death, July 17, 1857. His songs have a lightness and wit, a smoothness of movement and, at times, a deep humanity and pathos, which make their author still the favorite singer of his countrymen. Besides his poems he wrote the story of his own life

**Berbers** (*bĕr'bĕrs*), an interesting people living in the mountainous regions of Barbary and in the northern parts of the Great Desert They are called Kabyles in Algeria, Shelluh in Morocco, and those in the desert, Tuaregs or Tawareks by the Arabs. They are the descendants of the earliest inhabitants of northern Africa, and though they have in their veins an admixture of negro blood, and have been conquered at different times by the Phœnicians, Romans, Vandals and Arabs, they are still in many respects a distinct and peculiar race. Their number is between three and four millions. They are fierce and cruel, and usually at war either with their neighbors or among themselves They have herds of sheep and cattle, till the soil, manufacture swords, guns and gunpowder, and work the mines of iron and lead in the Atlas Mountains. In appearance they are strongly built and of middle height, with a complexion varying from red to reddish brown. They are followers of Islam.

**Berea** (*bĕr-ē'ȧ*) **College,** a non-sectarian, co-educational institution situated in Berea, Ky. In 1906 there were 1,018 students enrolled The president is Wm. G. Frost, Ph D., D.D. The college was founded in 1855 by anti-slavery Southerners, and was intended for the youth of the mountainous district of the South. For many years it admitted both white and colored students, but in 1904 the legislature of Kentucky passed a bill prohibiting co-education of the races in any of the educational institutions of that State. The object of this bill was to break up the co-education of races in Berea College.

**Beresford, Lord Charles,** born 1846, rear-admiral of the British navy, gained distinction by his skillful operation of the gunboat *Condor* at the bombardment of Alexandria in 1882. In this action he silenced one of the strongest Egyptian batteries. He served in Egypt under Lord Wolseley, and commanded the naval brigade in battle after battle. In 1875 he accompanied the Prince of Wales on his visit to India. Lord Charles visited the United States in 1899 and again in 1906, on the latter occasion to claim a legacy. He has earnestly endeavored to promote a good understanding between the United States, England and Germany upon the Chinese question. He advocates the "open-door" policy. He is a prominent member of Parliament, and has written books upon the Chinese question and the life and times of Lord Nelson.

**Ber'gamot, Oil of,** made of the rind of the fruit of the so-called Bergamot orange, now cultivated in the south of Europe. The oil is used in making pomades, fragrant essences, cologne, etc., and also in diluting the expensive oil of chamomile. It is of a pale yellow color or almost colorless. It is obtained by distilling or by grating down the orange rinds and then subjecting them to a strong pressure. One hundred Bergamot oranges will yield about two and a half ounces of oil. The name comes from Bergama, a city in Asia Minor, the ancient Pergamos.

**Bergen, Norway,** founded in 1070 A.D., is the center of the fish trade of the Northmen; and has now some 75,000 inhabitants. Bergen lies to the northwest of Christiania about 186 miles. It is a picturesque city, being surrounded on three sides by water, and enclosed upon the fourth side by mountains three thousand feet in height.

**Bergerac** (*bĕr'zhe-rȧk'*), **S. Cyrano de** (1619–55), a noted French dramatist and novelist, with a gift for the writing of burlesque romance and satire. Born at the Chateau de Bergerac in Perigord, he grew up a man of the world, entered the army, and is known to have fought many duels. He gave free play to his satirical humor, which at times got him into trouble, particularly with the Jesuits of his era, whom he satirized, as in his political letters and quips he satirized Cardinal Mazarin, Prime Minister of France during the minority of Louis XIV. He is doubtless best known, however, by his *Comic Histories of the States and Empires of the Moon,* with a companion work on the Sun. The influence of these books can be traced in the imaginative and whimsical later work of Dean Swift, Jules Verne and Edgar Allen Poe. Bergerac's other work embraces a comedy of character entitled *Le Pedant Ione,* and *Agrippine,* a tragedy. Bergerac is the theme of a brilliant modern drama by Edouard Rostand, *Cyrano de Bergerac,* played with acceptance not only in France, but in England and the United States. Bergerac, as has been often remarked, was the first author to use the novel to teach natural science, as he was the first author of note in France to manifest the influence of early English fiction.

**Bergh, Henry,** a philanthropist and author, was born in the city of New York, of German parents, in 1823. After he graduated from Columbia College, he wrote several poems, dramas, sketches, and served as secretary of legation to Russia; but on returning from abroad, he determined to devote the remainder of his life to the cause of dumb animals. On April 10, 1866, after

several years of hard work, in speaking, lecturing and working in the street, in the court-room and in the halls of legislature, the first Society for the Prevention of Cruelty to Animals was incorporated by the legislature of New York, and since then most of the states and territories have organized societies. Cruelty to animals of all kinds is dealt with by the society, and a great work has already been done in educating public opinion to the sense of the need of reform. There is now a very large membership, and many friends have donated money liberally to its support, one patron, Mr. Lewis Bonard, giving his entire fortune of $150,000. Out of this movement has also grown the Society for the Prevention of Cruelty to Children, which has become almost as widespread as the original society. Henry Bergh died in New York, March 12, 1888.

**Be'ring (or Behring) Sea,** a part of the North Pacific Ocean, commonly known as the Sea of Kamchatka, is bounded by Kamchatka, Alaska, the Aleutian Islands and Bering Strait, which connects it with the Arctic Ocean. The strait was passed through first by a Siberian named Deschner, in 1648, and later the sea and strait were explored by Bering, a Danish navigator in the employ of Peter the Great, in 1741. The latter died on Bering Island, one of the Aleutian group. The seal fisheries of Bering Sea caused a sharp dispute between the United States and Great Britain on behalf of Canada. These fisheries, owned and operated by Americans directly for their own benefit, but indirectly for the benefit of the world, were in danger of being entirely destroyed by the lawless acts of the Canadian seal-fishers or sealers An agreement was concluded which permitted the United States to put a stop to the acts of the Canadian sealers and provided that the whole dispute be settled peaceably by a board of arbitrators.

**Bering Strait,** a narrow water-passage north of the Aleutian Islands and Bering Sea, in the Northern Pacific, connecting the latter with the Arctic Ocean. It is in the vicinity of long. 170° W., having on the east of it Alaska and on the west the projecting peninsula of Siberia, in Russian Asia. It was at an early era discovered by a Russian Cossack navigator, named Deshneff, and subsequently explored by Captains Bering and Cook. At its narrowest part it is about 40 miles in width, and has a depth varying from 150 to 250 feet, the deeper water being on the Asiatic side. St. Lawrence Island lies to the south of the Strait, in Bering Sea.

**Berkeley** (*bĕrk'lĭ*), a town in Alameda County, California, in Oakland Township, is situated on the east shore of San Francisco Bay opposite the Golden Gate. It is five miles from the city of Oakland, which lies immediately south of it, and eight miles from San Francisco. The Southern Pacific and Santa Fe railroads both pass through the town. Communication with San Francisco every twenty minutes is furnished by the Southern Pacific local trains and the Realty Syndicate furnishes a like number of the best equipped electric trains every hour. A large number of manufactures and planing mills are located near the water front. The University of California, the State Agricultural College and the State Institution for the Deaf, Dumb and Blind are located here. The population, which is growing quite rapidly, is now 54,879.

There is a complete school system, including manual training, domestic science, primary and grammar schools and high schools, including a Polytechnic High School. Within the last two years, bonds to the amount of one-half million dollars have been voted for school purposes, and municipal bonds for a like amount for other municipal improvements have also been voted.

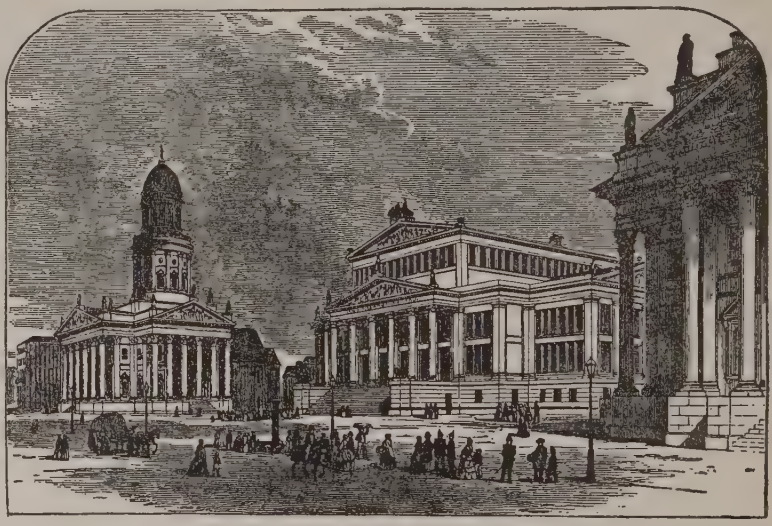
**Berkeley, George,** bishop of Cloyne, was born near Kilkenny, Ireland, in 1685. After graduating at Trinity College, Dublin, he remained there thirteen years as a fellow, studying and writing on philosophy. His theory, called *Idealism* was that the world exists only in our thoughts and that the objects around us are only ideas, which God, as the highest reason, causes to pass before our minds. At Trinity he had become a friend of Dean Swift, and in 1713 he went to London, where Swift introduced him into the brilliant society of the reign of Queen Anne. He next traveled for some years through France and Italy On his return he wrote a great deal on social questions. In 1728, having formed a plan to convert the American savages, he came to America, and for three years lived in Rhode Island, writing, studying and preaching. He then gave up his work and returned to England, leaving his library of 800 volumes and his estate in Rhode Island, called Whitehall, to Yale College. He was soon after made bishop of Cloyne, in the south of Ireland, where he lived for eighteen years, and then removed to London and died in January, 1753. Besides his writings on philosophy and social questions, Bishop Berkeley wrote the well-known stanzas *On the Prospect of Planting Arts and Learning in America,* in which occurs the famous line: "Westward the course of empire takes its way."

**Berkeley, Sir William,** colonial governor of Virginia in the time of Charles I and Charles II of England, was born near London in 1608, and died in England in 1677. He was commissioned royal governor of Virginia in 1641, and being a monarchist and partisan of the crown, he held, for nearly thirty-five years, this colonial outpost, with

the exception of the interval of the Commonwealth. During the Cromwellian period Virginia was an asylum for many Englishmen of rank who were loyal to the crown; the colony, indeed, was among the last of the crown possessions abroad to acknowledge the Protector's authority. Berkeley, in his later years, grew irascible and intolerant, and behaved despotically toward those who took part in Nathaniel Bacon's rebellion (see the latter). He was opposed to free schools, to printing and to religious liberty, and was recalled to England in 1676.

**Ber'lin.** A city of 13,664 in Waterloo County (Ontario), one of the busiest manufacturing centers in all Canada. Is rapidly growing. Amongst other articles of manufacture may be mentioned furniture, leather, buttons, machinery and felt goods. Population largely of German descent, churches, schools, private residences noticeably attractive, evidences of thrift and progress everywhere, the County of Waterloo is one of the richest and most fertile in all Canada. Another important manufacturing town, Waterloo, lies immediately adjacent to it.

**Berlin,** the capital of Prussia and, since 1871, of the German Empire, the third largest city of Europe, lies on the banks of the River Spree, which flows through the center of the city from southeast to northwest. Its population is 2,070,695, and it covers an area whose circumference is nearly thirty-five miles The city dates as a small fishing village as far back as the 13th century, but the beginning of its rapid growth and prosperity was not made until the Great Elector, Frederick William (1640-88), united the separate duchies of which Prussia is now formed, and made Berlin the capital of the new state. Among the fine buildings for which the city is noted are the royal palace, with 700 apartments, and other palaces; the royal library, with over 710,000 volumes and 25,000 manuscripts; the old and new museums, with their fine collections and art galleries; the national gallery; the arsenal; the royal theater; the opera house; the guardhouse; and the university. Throughout the city and in the parks are numerous statues of national heroes, and monuments, such as the great Column of Victory, 197 feet high. The street called from its double avenue of limes *Unter den Linden* is one of the finest streets in Europe. The University of Berlin is now one of the foremost in Germany. Founded in 1810, it has had many famous professors and scholars It now numbers over 414 professors and lecturers with over 5,000 students, and as many more non-matriculated students. Besides the university, there are the Academy of Sciences, one of the most learned institutions in Germany; the military academy and academies of art and architecture; and the schools of mining, agriculture, artillery, engineering, music, etc. The Zoölogical and Botanical Gardens are also worthy of mention. The commerce of Berlin, carried on by the Spree, the canals and many railroads, with its manufactures, places it in the front rank of the mercantile cities of the continent. Grain, cattle, spirits and wool are the staples of trade. The exchange is daily visited by 3,500 persons. The main branches of industry are woolen weaving, calico printing and the manufacture of engines and other machinery, also of iron, steel and bronze wares, drapery goods and confections. Together with Leipsic, Berlin holds the first place among German cities in the publishing trade. Owing to the recent great strides in German manufactures and in the extension abroad of German colonies, the capital has become a still greater financial and imperial center.



BERLIN—ROYAL THEATER AND NEW CHURCH IN THE GENSDARMENMARKET

**Berlin, N. H.,** a city in Coos County, on the Androscoggin River and on the Grand Trunk and the Boston & Maine railroad, 16 miles north-northeast of

Mount Washington. It has large lumber and pulp mills, with an extensive annual product and employing a large force of men. Its other industries, all of which are usefully served by good waterpower, include shoe manufacture and other activities. The city is lighted by electricity, and possesses a public library, several fine church buildings and schools, as well as a number of attractive residences. Population, 11,780.

**Berlin, Treaty of.** After the Russo-Turkish War of 1877, what is known in Europe as the Eastern Question arose to trouble the diplomats, and a congress of the great powers met at Berlin, at the call of Prince Bismarck, to settle the affairs of the Balkan Peninsula and other boundary disputes. As a result of the conference, the Treaty of Berlin was drafted and signed by the representatives of the respective powers, modifying in some degree the Treaty of San Stefano, previously concluded between Turkey and Russia. By the Treaty of Berlin, Russia received from Rumania the territory called Bessarabia, lost by the Crimean War, and she acquired the fortress of Kars and the port of Batum; Bulgaria, the territory between the Danube and the Balkans, became virtually independent; Montenegro acquired full freedom; and Servia and Rumania became independent kingdoms. Bosnia and Herzegovina were at the same time transferred to the rule of Austria, while Cyprus became a British possession; and Greece acquired Thessaly and a portion of Epirus. The Turkish empire in Europe was thus reduced to narrow limits.

**Berlioz** (*bĕr'lĕ-ôz'*), **Hector,** a great but eccentric musical composer, was born in 1803, at Côte St. Andre, near Grenoble, and was the son of a physician. Disregarding the wish of his father, who wanted his son to follow his own profession, he studied music at the Conservatoire in Paris, winning several prizes. In Italy, where he studied for a year, he became acquainted with Liszt and Mendelssohn. On his return to Paris, in 1832, he brought out some of his compositions, but their success was so small that he had to eke out his living by writing for musical journals and giving concerts. In his foreign concert tours he was far more successful than in his own country, being received with enthusiasm and offered several lucrative posts. He died at Paris in 1869. His *Faust* is his most popular musical composition. His symphonies, such as *Romeo and Juliet;* his opera, *Beatrice and Benedict;* his overtures, as *The Carnival of Rome;* and his sacred pieces, as *The Childhood of Christ* and his *Te Deum*, are among his most successful achievements. His literary work is also of a high order. Liszt, Heine and Balzac, the great novelist, were among his intimate friends.

**Bermu'das, The,** or **Somers' Islands,** are British possessions in the Atlantic, southeast of Cape Hatteras, 680 miles from New York. They were named from the Spaniard Bermudez, who first sighted them in 1522, and from the Englishman, Sir George Somers, who was shipwrecked there in 1609. They are said to be 360 in number, but many are mere specks, the whole being only about 12,000 acres in extent. They are composed of coral sand and are surrounded by a living, growing reef of coral. They are important to the British government as a half-way station between its possessions in Canada and the West Indies. Hamilton, the seat of government, is situated on Main Island. The next in importance is St. George's Island, which has a strongly fortified harbor. On Ireland Island is the Bermuda floating dock, built in England and towed out in 1869. It is 381 feet long and 124 feet wide. A large number of the islands are without name or inhabitant. Because of the balmy and temperate climate the Bermudas have become in winter a popular resort, for Americans as well as for English; and St. George's and Hamilton have many hotels. Although the soil is poor, yet, because of the absence of winter frosts, crops can be prepared for March, April, May or June, and so their early potatoes, onions, tomatoes and other garden vegetables bring high prices in the New York markets to enrich the Bermudians. The population is 17,535, more than half of which is colored. A governor and council of six members, appointed by the crown, and an assembly of thirty-six, four being elected by each of the nine parishes into which the Bermudas are divided, make up the governing body. The chief town is Hamilton, population, 2,627.

**Bern** or **Berne,** the capital of the canton of Bern and of Switzerland, lies on a promontory formed by the River Aar, which surrounds it on three sides. The population, 85,264. Berne is the first city in Switzerland, although Zürich, Bâle and Geneva have each larger populations. The houses are massive, built of freestone, resting on arcades, which are lined with shops and furnish a covered walk on both sides of the streets. A bridge which spans the Aar is one of the largest bridges in Switzerland. The Gothic cathedral, mint, hospital and university are among the fine buildings of the city. The trade is chiefly in dress fabrics and hats. The figure of a bear is conspicuous in the ornaments of the place, in allusion to the origin of the name Bern, and a bear's den is maintained by the municipality at public expense. The area of the canton is 2,675 square miles, with a population, 642,744.

**Bernadotte** (*bĕr'nȧ-dŏt'*), **Jean Baptiste Jules,** king of Sweden and Norway as Charles XIV, was born at Pau, in the south

of France, January 26, 1764, the son of a lawyer. He entered the army as a private, but his promotion was rapid after the outbreak of the French Revolution. In 1794 he was a general in command of a division, and in 1804 he was made a marshal in the army. In 1797 he was sent with 20,000 men to re-enforce the army of Italy, which led to his first meeting with Napoleon. Of all Napoleon's marshals, Bernadotte was the one least under his influence, and refused to help him in any of his political designs. But his generalship was highly thought of by his chief. He commanded the center at Austerlitz and helped to prevent the allies from turning the right flank of the French army. With a separate command, he defeated the Prussians at Halle and forced Blucher to surrender. He defeated the Russians at Mohrungen, commanded a corps of Saxons at the battle of Wagram, after which a dispute with Napoleon caused his resignation. Bernadotte was also, for a time, minister of war and ambassador to Vienna. He was elected crown prince of Sweden in 1810. He refused to agree to Napoleon's demand that he should pledge himself not to take up arms against France, saying that from that time the interests of Sweden were his It was not, however, until French troops invaded Sweden that he attacked Napoleon. When Napoleon declared war against Russia, Bernadotte held in his hands the destiny of Europe, Napoleon offering him large territories if he would attack Russia. He, however, joined the allies, but halted when France was invaded, before reaching the border, determined not to attack his native land. In 1814 he forced Denmark to cede to him Norway, which until June 7, 1905, remained joined to Sweden. In 1818 he became king of Sweden and Norway under the name of Charles XIV. Throughout his long reign of twenty-six years, though knowing nothing of the languages of his subjects, he ruled successfully and built up the country in many ways. He died at Stockholm, March 8, 1844.

**Bernard** (*bẽr-närd'*), **Great Saint,** a mountain pass of the Alps, between the Swiss canton of Vaud and the valley of Aosta. At the highest point of the pass, nearly 8,000 feet above the sea, near the line of perpetual snow, is the monastery or hospice of St. Bernard. It is said to have been founded in 962, for the succor of travelers crossing the mountains. The celebrated St. Bernard dogs are trained to assist in this work. By this pass, Roman armies, armies under Charlemagne and Frederick Barbarossa and Napoleon's army of 30,000, with artillery and cavalry, crossed the Alps. The Little St. Bernard is a mountain 7,200 feet in height, south of Mont Blanc. It has a pass by which Hannibal is thought to have crossed into Italy.

**Bernardino de Betto Bagio.** See PINTURICCHIO.

**Bernhardt** (*bẽrn'härt*), **Rosine** (called Sarah), a famous French actress, was born in Paris in 1844. Her parents were Jews, but she was brought up in a convent at Versailles. She made her first appearance on the stage in 1862, at the Théâtre Française, but at first attracted little notice. In 1867 her playing of the part of Marie de Neuberg in a play by Victor Hugo, called *Ruy Blas*, made her famous. She then went back to the Théâtre Française, in Paris, and after 1879 began to appear each year in London, where she was very successful Her trips through America and Russia were also successes. In the United States her favorite rolês were those of Fédora and La Tosca, while she drew immense audiences when she appeared in Adrienne Lecouvreur and La Dame aux Camélias. Madame Bernhardt is probably the greatest living actress of tragedy. She is also gifted as an artist and a sculptor.

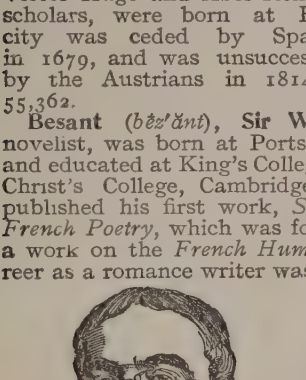
SARAH BERNHARDT

**Bertill'on System, The,** was made public by Dr. Alphonse Bertillon in 1885 in Paris, after he had been at work upon it for six years. The purpose of the system is to identify criminals. Its chief feature is accurate bodily measurement. After the age of twenty the skeleton is almost wholly fixed; and yet in no two individuals are the measurements of parts of the body liable to be closely alike. Precise descriptions, in which the color of the eyes is most important and also photographs are employed to assist the method of measurement. Marks, moles and scars are carefully noted, and their position is registered with great exactness. The system has now been adopted in most European countries. Its employment in the United States dates from 1887. It is very needful to identify criminals; and the Bertillon system makes innocent persons safe from the danger of being identified with some criminal who may resemble them. In Paris there is a collection of the measurements and descriptions of no less than 120,000 criminals; and it is likely that the United States will form a similar central collection, for it is said that European criminals flock to the United States because the Bertillon system is less universal in this country.

**Beryl,** a precious stone, a variety of emerald and known also as aquamarine. They are usually found embedded in granite or in veins that traverse granite or gneiss. Their color is sometimes yellowish and sometimes of a greenish-blue tinge. The best beryls come from Brazil, Ceylon and Siberia; the common opaque beryl is met with in this country. The difference between the beryl and the emerald is due to the coloring-matter; both are double silicates of alumina and glucina; in the beryl the coloring matter is oxide of iron, and in the emerald it is oxide of chromium.

**Besançon** (*be-zän'sôn'*), a French city, capital of the department of Doubs, lies on both sides of the River Doubs. The citadel is perched on an almost inaccessible rock, 410 feet above the river, and the city is so well fortified that it is considered one of the strongest places in France. In the days of Cæsar it was called Vesontio, and there he gained several victories. Some streets still bear old Roman names, and Roman ruins are to be seen in the neighborhood. The modern inhabitants are largely engaged in watch-making, the yearly product being nearly 450,000 watches. Victor Hugo and Abel Rémusat, the great scholars, were born at Besançon. The city was ceded by Spain to France in 1679, and was unsuccessfully beseiged by the Austrians in 1814. Population, 55,362.

**Besant** (*bĕz'ănt*), **Sir Walter,** English novelist, was born at Portsmouth in 1836, and educated at King's College, London, and Christ's College, Cambridge. In 1868 he published his first work, *Studies in Early French Poetry*, which was followed later by a work on the *French Humorists*. His career as a romance writer was in conjunction with a journalist, James Rice, in partnership with whom appeared *Ready Money Mortiboy* and many other novels. Of the stories that appeared in his own name the best are: *All Sorts and Conditions of Men, Children of Gibeon, All in a Garden Fair, Katherine Regina, For Faith and Freedom, Armorel of Lyonesse* and *The Orange Girl*. Sir Walter took great interest in matters that affect the interests and status of authors in respect of copyright; he was for many years secretary to the Palestine Exploration fund; and the People's Palace, in the East of London, was inspired by one of his stories. He was knighted for his services to literature in 1895. He died June 9, 1901.



WALTER BESANT

**Bes'semer, Ala.,** a city in Jefferson County, in the center of an iron-producing region, on the Louisville & Nashville and other railroads, 11 miles southwest of Birmingham. Its industries embrace large iron and steel works, blast furnaces, foundries, rolling and planing mills, machine shops and fire brick works. There are coal as well as iron mines in the vicinity. Population, 20,000.

**Bes'semer Process.** See STEEL.

**Bessemer, Sir Henry,** an English inventor and engineer, was born in Hertfordshire in 1813, and died in London, March 14, 1898. He is famed for his many inventions, but especially for the revolution in the steel making trade, due to his cheap and ready process of making steel from pig-iron. The process increased the output of steel enormously both in this country and in England: in England the annual production at once rose from 50,000 to 3,000,000 tons, while the price fell nearly 80 per cent. The Bessemer invention consisted in taking the pig-iron when in a state of fusion and blowing a blast of air through it, to clear it of all carbon, and then adding the necessary carbon to produce well-tempered steel. He was knighted in 1879, and was the recipient of many honors and decorations. See KELLEY, WILLIAM.

**Beth'any,** meaning "the house of dates," lies on the southern slope of the Mount of Olives, in Palestine, 2,208 feet above the sea. This little village was the home of Lazarus and his sisters, and was often visited by Christ, and there He worked his greatest miracle. It was also the scene of His ascension. It is now a place of about 200 inhabitants. Houses said to be those of Martha and Mary and the cave where Lazarus was buried, are pointed out to the traveler.

**Bethes'da, Pool of,** meaning "house of mercy," or "house of the stream," is the tank or pool at Jerusalem associated with Christ's healing of the impotent man. The large reservoir, called "Birket Israel," near St. Stephen's gate, and the spring Gihon or En Rogel, in Kedron Valley, are each cited by different scholars as the place of this ancient pool.

**Beth'lehem,** meaning "house of bread," now called Beitlahm, known as the birthplace of Christ and of King David, is a small village six miles south of Jerusalem. The present inhabitants, numbering about 3,000, live by making and selling crucifixes, beads, boxes, shells and other articles of mother-of-pearl and of olive wood. The Convent of the Nativity is a large square building, believed to have been built by the Empress Helena, 327 A. D.; destroyed by the Moslems in 1236; and rebuilt by the crusaders. The Church of the Nativity within it is

divided among the Latin, Greek and Armenian Christians, who make up the entire population. The church is in the form of a cross, the finest part being the nave, which is supported by forty-eight Corinthian columns of solid granite. At the head of the cross, a sculptured marble star marks the entrance to a long passage descending to the crypt or chamber, in which a silver star shows the spot where Christ is said to have been born. The star is engraved with the words, in Latin: "Here Jesus Christ was born of the Virgin Mary." The manger in which he was laid is in a recess cut in the rock.

**Bethlehem, Pa.,** a borough in Northampton County, about 55 miles north of Philadelphia, with which the town of West Bethlehem was incorporated in 1904. Total population (census 1910) 12,837. It is situated on the Lehigh River and Canal, two bridges across which give access to South Bethlehem, the seat of Lehigh University. Bethlehem is reached by the Central Railroad of New Jersey, the Lehigh Valley and the Philadelphia & Reading railroads. Founded by Moravians in 1742, it early became a noted seat of the Brethren of that church and of their institutions, including a theological seminary and academy known as Nazareth Hall, located since 1858 at Bethlehem. The town has a public library and a hospital (St. Luke's); it has also considerable manufactures, including silk-mills, iron and steel works, zinc and graphite works, knitting mills, and large paint works. The town, which was incorporated in 1845, received its charter in 1851, and it owns and operates its own water-works. In the Revolutionary War a hospital of the Continental Army was located here, and in West Bethlehem are the graves of some 500 soldiers. See an article by Jordan on *Bethlehem During the Revolution*, in the *Pennsylvania Magazine of History* (Philadelphia, 1890); also Martin's *Historical Sketch of Bethlehem* (Philadelphia, 1872).

**Bethsaida** (*bĕth-sā'ĭ-dà*), meaning "house of fish," is the name of two villages on the Lake of Galilee. The one on the western shore was the birthplace of Peter, Andrew and Philip, the Apostles. A heap of grass-grown ruins is thought to mark its site. The other, at the northern end of the lake, lies adjacent to the scene of the feeding of the five thousand by Christ. It was afterward called Julias.

**Beust** (*fŏn boist*), **Frederick Ferdinand von, Count,** a prominent modern German statesman, was born in Dresden in 1809. He devoted himself to politics, and was employed by his government in different services in Berlin, Paris and London. In 1849 he was made minister of foreign affairs. He opposed Prussia, and after the battle of Sadowa, entered the service of Austria, where he was made chancellor in 1867. He completely reorganized the Austrian Empire, and the present constitution was his work. He was later an Austrian ambassador at London (1871–78), and acted in the same capacity at Paris (1878–82). He died October 24, 1886.

**Bevan, Theodore F.,** F.R.G.S.A., the explorer, was born near London, October 14, 1860, and has largely given his life to the exploration of British New Guinea. In 1887 he discovered the Aird and the Purari Rivers there, the latter the next to the largest in the territory.

**Bev'eridge, Albert Jeremiah** (1862–), American senator, was born in Highland County, Ohio, and as a child was taken by his parents to Indiana where his younger years were spent in farm and railway construction work. He, however, snatched time to study in the winter months and subsequently entered De Pauw University, at Greencastle, Ind., from which he graduated in 1885. He later on became clerk in a law office in Indianapolis, where he was drawn to political life and took part in the Blaine campaign of that era, meanwhile going on with his law studies, and was admitted to the bar. During the nineties he became widely known in his state by his political speeches, and in 1899 was elected as a Republican senator from Indiana. In the latter year he visited the Philippines, and in the following year he addressed the senate in favor of the administration's policy of retaining the islands under such local government as the situation demanded. This was in January 10, 1900. Among his many speeches and addresses is one on "The March of the Flag," delivered at Indianapolis, Ind., September 16, 1898. By these speeches he has made a notable mark, while he is also known as an author by his work on *The Russian Advance* (1904) and by a booklet, issued in 1905, entitled *The Young Man and the World.*

**Beverly, Mass.,** a city in Essex County, Mass., on an inlet of the Atlantic, 18 miles northeast of Boston, and on the line of the Boston & Maine (Eastern) Railroad. It has factories engaged in the manufacture of women's boots and shoes, and leather, the largest shoe machinery plant in the country and has considerable trade in fish. It possesses a good harbor and has a share in the coasting trade. Here is located the New England Institute for the Deaf and Dumb. Population, 20,679.

**Beyrout** (*bā'rōōt*) or **Beirut,** known to the ancients as Berytus, is a commercial city on the coast of Syria, 55 miles from Damascus and 147 from Jerusalem. It is the chief seaport and market town for all the trade on the shores of Syria and Palestine. British, French and Egyptian steamers maintain a regular service, carrying back wool, olive oil, gums and silk in exchange for their cargoes; and since the

opening of the Suez Canal a direct eastern trade in spices, coffee, indigo and jute has sprung up. The first line of omnibuses in Syria was established here in 1859, and water works and gas works have been introduced by European companies. A Scottish school for Jews and the Protestant Syrian College have also been founded here. The American Presbyterian Mission in Syria has its headquarters here. Population, 150,000.

**Bhutan** or **Bhotan** (*bŏŏ-tăn'*), an independent state, in the Eastern Himalayas, area about 16,800 square miles. It lies south of Tibet and north of Assam and Bengal, and is flanked in the west by Sikkim and Nepal. Its population is close upon 30,000, and its capital is Punakha, a place of much natural strength. It has a dual ruler, Deb Raja, the secular, and Dharin Raja, the spiritual, head of the state. Its trade is chiefly with British India, its main products being rice, Indian corn, millet, musk, chowries and silk. Formerly its native tribes were given to aggress on British India, but this was put a stop to, the Bhutan rulers receiving an annual subsidy from the Indian government conditional on the good behavior of the natives. The latter are nominally Buddhists, but their religious exercise consists chiefly in the propitiation of evil spirits and the recitation of verses from the Tibetan Scriptures. The principal monastery in Bhutan (Iasichozong), has 300 priests. The country has a varied climate and a wide range of products.

**Bible.** The word Bible comes from the Greek, where it is plural and means *the* books: books that stand apart from and in moral worth are higher than all other books. The Bible consists of two great parts, the Old and the New Testament—testament meaning covenant, a covenant between God and His people. The Jews had a threefold division of the Old Testament into the *Law*, the *Prophets*, and the *Sacred Writings*. By the *Law*, they meant the first five books, called usually the Books of Moses or the *Pentateuch*. Of course, law is not the only thing we find here. There is also history, from the story of the creation in *Genesis* to the death of Moses in *Deuteronomy*. But in this bed of history we find three sets of law or codes; the *Book of the Covenant* (Ex. xx-xxiii). which seems to have been followed by the Israelites till the reign of Josiah; *Deuteronomy*, which prevailed from the time of Josiah to the exile; and the *Priestly Code* (Leviticus), which came to be looked upon as authoritative after the Restoration.

The Jews divided the *Prophets* into the former prophets and the latter prophets. By the former prophets, they meant what we generally call the historical books, *Joshua*, *Judges*, *Samuel*, and *Kings*, which give us the sayings of the great prophet-statesmen, Samuel, Elijah, and Elisha, though they themselves wrote nothing. With the Israelites the sense of being a people and the sense of being a people of Jehovah were almost one and the same, and this is one reason why we find so much history in the Bible. So in the *Prophets*, as in the *Pentateuch*, we find history; Joshua to Kings being really one work, setting forth the fortunes of the people from the conquest of Canaan to the fall of Jerusalem.

The latter prophets are divided into the greater prophets, *Isaiah, Jeremiah, and Ezekiel;* and the minor prophets, the twelve smaller books. The prophets made predictions, but this was not all their work. They were sent usually to guide the people in great crises. Amos and Hosea came before the fall of Samaria, Isaiah during the great struggle with Assyria, and Jeremiah before the destruction of Jerusalem. The *Sacred Writings* include books of poetry—*Psalms*, *Proverbs*, *Ecclesiastes*, *Lamentations* and the *Song of Songs;* books of history—*Chronicles*, *Ruth*, *Esther*, *Ezra*, *Nehemiah*, and one prophet, *Daniel*. That the *Psalms* are true poetry no one will deny; yet there is no accent, or counting of syllables, no rhyme or rhythm. The one thing that makes the *Psalms* the finest religious poetry in the world is what is called parallelism; that is, an arrangement in couplets or pairs, the second line repeating or contrasting the thought of the first. There is much poetry outside of the poetical books, and the oldest piece of writing in the Bible is a song, that of Deborah (*Judges v*).

Running all through the Old Testament we find hints, passages, and whole discourses showing that Jehovah had promised the people a deliverer out of all their troubles, who was to be known as the *Messiah*. It is these Messianic prophecies, as they are called, more than anything else, that bind the Old Testament to the New Testament, which tells of a new covenant, through Christ the Messiah.

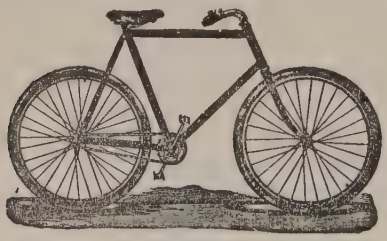
The New Testament begins with four accounts of Christ by his followers, called the Gospels The authors of the first and fourth, Matthew and John, were themselves disciples, while the other two gospels were written by Mark, a follower of Peter, and Luke a companion of Paul. The *Acts of the Apostles* tells of the planting of the church. Then follow twenty-one letters of the Apostles—personal letters, as the epistles to *Timothy*, and letters to the churches that sprang up as the Apostles went preaching from town to town and from country to country. Christ uttered prophecies, but the one prophetical book in the New Testament is the *Revelation* of St. John.

The Old Testament was written in Hebrew on skins, linen cloth, or papyrus and kept in rolls. The first draft of *Matthew* seems to have been in Hebrew, but was

translated into Greek, in which language were written the other New Testament books, as the Greek tongue was read and understood throughout the Roman world. In modern times translations have been made into all spoken languages. The first English version was *Wiclif's Bible* (1382). Tindale's *New Testament* was the earliest printed version, and Miles Coverdale brought out the first complete English Bible in 1535. Other editions followed: the *Great Bible*, brought out through the efforts of the Protector Cromwell; the *Geneva Bible*, through the English refugees at Geneva in the reign of Mary; the *Bishop's Bible*, superintended by Archbishop Parker; the New Testament at Rheims, and the Old Testament at Douai, by the English Catholic College. The *King James* or *Authorized Version* appeared in 1611, the work of six committees of scholars. The *Revised Version*, the joint work of English and American scholars, appeared, the New Testament in 1880, and the Old Testament in 1884. The most famous version in a foreign language is the German Bible of Luther, finished in 1534.

**Bichat** (*bē'shȧ'*), **Marie François Xavier** (1771-1802), a very talented anatomist and physiologist who made an epoch by studying the tissues and thereby founding modern histology (q. v.). He is regarded by Buckle as a greater man than Cuvier. He died at the age of thirty-one, worn out by too severe application to study and research.

**Bicycle** (*bī'sĭ-kl*), a machine, as the name shows, for riding with two wheels, moved by pressing the feet on pedals. The first two-wheeled "cycle" was called the "dandy horse," and was moved by kicking the feet, one after the other, into the ground, and then holding them up until the dandy horse stopped, when the process was repeated. The first practical bicycles were made in England in 1869, of wood and iron, and were



BICYCLE

fitly called "bone-shakers." The invention by an Englishman soon after of the rubber tire and steel frame made the modern bicycle. The old high-wheeled bicycle, with its tendency to "headers" was soon laid aside for the convenient "safety," which is now in most common use. The pneumatic tire, ball bearings, which greatly reduce friction, the evolution of the chainless wheel and other improvements, together with a large reduction in cost, made the bicycle a popular and expeditious means of travel and recreation for old and young of both sexes and all classes. "Cycling clubs" became popular and long tours were made with ease. While bicycling as a sport has largely died out, the wheel is still widely used as a practical and convenient means of locomotion.

**Biddeford, Me.**, a town in York County, Me., on the Saco River, and opposite Saco Falls, six miles from the Atlantic and 15 miles southwest of Portland. The town was settled early in the 17th century, was incorporated in 1718, and became a city in 1855. The city has excellent water power, and as a result is a manufacturing center. Among the leading products are lumber, boots, shoes, machinery and also the extensive manufacturing of cotton cloth and leather tanning. The vicinity of the city is rich in good granite, and the export of this fine building stone adds considerably to the industrial wealth of its people. Biddeford has an excellent school system and a high school building erected at a cost of $50,000, a fine public library and daily, weekly and monthly papers. Population, 17,079.

**Bien'nials**, plants which endure through two growing seasons. See DURATION.

**Bienville** (*byăn'vēl'*), **Jean Baptiste, Sieur de**, French governor of Louisiana, was born in Montreal, Canada, in 1680, and died in France in 1768. With his brother, Iberville and a few settlers from old and new France, Bienville erected a fort in 1699 at the mouth of the Mississippi, and was for many years director of the colony, and subsequently governor of Louisiana. Quarreling with La Salle, the royal commissioner, Bienville was for a time deposed from office and recalled to France; but was afterward reinstated. When Law's Mississippi company was formed, Bienville moved his headquarters to New Orleans in 1718, and founded the town. Later on, having undertaken unsuccessful expeditions against the Chickasaw Indians, he was removed from the governorship, and in 1743 returned to France. He published the *code noir* (black code), which remained in force in the colony until Louisiana was purchased by the United States. The code was rather vigorous in its provisions, as not only did it regulate the condition of the slaves, but banished Jews from the colony, and banned every religion save that of the Roman Catholic Church.

**Bierstadt** (*bēr'stȧt*), **Albert**, an eminent American artist, was born near Düsseldorf, Germany, in 1830. His parents emigrated to the United States when he was two years old, but he returned when older and spent several years in study in his native city. In 1858 he visited the Rocky Mountains, and the first result of his visit was his sketch of *Lander's Peak*,

which attracted special notice in the Paris exposition of 1867. Upon this picture and upon his other landscapes his fame mainly rests. Other works are the *Domes of the Yosemite, Laramie Peak, Emigrants Crossing the Plains, Mt. Hood* and *Mt. Whitney.* In 1873 he visited the Pacific Coast and painted a series of pictures of that region. His house and studio at Irvington, N. Y., were burned in 1882. Fortunately some of his best pictures were on exhibition in New York city at the time and so were saved. He was a member of the Academy of Fine Arts at St. Petersburg. His death occurred in 1902.

**Big Black River,** a river of Mississippi, is about 200 miles long and flows into the Mississippi. It is navigable for boats for fifty miles, and is bordered by rich cotton plantations for most of its length.

**Big Horn River,** the largest branch of the Yellowstone, rises in the Rocky Mountains in the northwest part of Wyoming, where it is called the Wind River. It enters the Yellowstone at Big Horn city, in Montana, and is about 350 miles in length.

**Big Sandy River** flows into the Ohio and forms the boundary between Kentucky and West Virginia. Steamboats navigate it for a hundred miles. The timber and coal along its valley are very valuable.

**Bigelow** (*big'e-lō*), **John,** American journalist and author, was born at Malden, N. Y., November 25, 1817. He graduated at Union College in 1835, and for a time practiced law, but afterward deserted it for journalism. In the fifties he was one of the editors of the New York *Evening Post,* and in the following decade was consul, and subsequently (1864–67) United States minister to France. In 1875–77 he was secretary of the state of New York. His writings include *Lives of Frémont* and *Wm. Cullen Bryant; France and Hereditary Monarchy;* and a History (in French) of *The United States of America in* 1863. He also edited *Franklin's Autobiography and His Works* and the *Speeches of Samuel J. Tilden.* He died Dec. 19, 1911.

**Billiards,** an indoor pastime of great popularity, calling for the exercise in playing the game not only of a quick eye but also of a steady hand and delicate touch, besides good judgment in estimating the strength of stroke necessary to good billiard playing, in addition to proficiency in the use of the cue, with which the game is played, and correctness and accuracy of aim. Not much definitely is known of the origin of the game, though it would appear to have been played in many parts of Europe during the Middle Ages, in the 15th century in France, and later on in England. About the year 1565 it would seem to have been introduced on this continent by Spaniards residing in Florida. The game is played with two white balls propelled by ivory-tipped cues or staffs usually well-chalked, in the hands of the players, on an oblong rectangular table, with a cloth or baize covering over its slate bed, the table having vulcanized cushions round its inner sides, so that the balls when they strike the sides may rebound from it in the player's design to strike not only his opponent's white ball, but the red ball placed in position on a small black spot at the head of the table bed, and in the center of it. The players may be two or more in number on each side. In Great Britain the tables are generally furnished with six pockets at the four corners and on either side, the players commonly using four balls; while in France and in this country the game is played with three balls, and on a table without pockets. The balls, which are of ivory 2⅜ inches in diameter, are propelled by a cue, made of maple or ash wood 4½ to 5 feet in length, the diameter at the butt end averaging 1½ inches tapering to a point at the delivery end of from ⅝ths to a ½-inch in diameter. Balk-lines are frequently marked on the billiard table, in championship games 14 and sometimes 18 inches from the sides and top and bottom, to give increased interest to the matches and calling for higher skill in playing games. In playing the game the lead off is determined by what is called banking. The several players take their stand at the foot of the table, and each strikes his ball in turn with such force as to send it to the head or far end of the table and back again, the player whose ball lands nearest the foot or near cushion being declared winner. The game is begun by placing the red ball on the marked spot at the head of the table, while the white ball of the player who has lost the bank is placed on the spot at the near end. In opening the game the player must strike his opponent's white ball before striking any other with his own ball. A shot is made when the player strikes his ball so that it shall hit the two object balls; and he continues to play until he fails in this, when it is his opponent's turn to play. For other details of the game, see any good work on billiards; also, see the important contemporary almanacs of the year for records of notable matches and championship tournaments.

**Billings, Montana,** a city, the county seat of Yellowstone County, on the Yellowstone River, about 236 miles east by south of Helena, and reached by the Northern Pacific, Great Northern and Chicago, Burlington & Quincy. It is the center of a large live stock, sheep raising and agricultural region, having considerable trade in the shipment of live stock and an extensive export of wool. In its neighborhood are important mineral deposits, chiefly of coal, limestone and marble. Among its

public buildings, besides a city hall and court house, are a public library and an opera house. Population, 15,000.

**Bill of Rights.** This name is commonly given to the declarations of the rights of citizens which are prefixed to the constitutions of most of the states of the Union. It is also given to the first ten amendments to the U. S. constitution, proposed by the first constitutional congress and adopted in 1791 by the states. The original bill of rights was, however, an English act of Parliament which summed up the results of the revolution which had placed William and Mary on the throne. This bill of 1689 made it illegal for the crown to suspend the laws, levy money without the consent of parliament, or keep a standing army in time of peace. It also declared the rights of citizens to impartial and not over-severe justice, frequent parliaments, carrying arms for self-defense, free elections and petition to the king. To this bill of rights was added an act for the settlement of the crown upon William and Mary and their children; and next upon Anne and her children.

**Bimet'allism.** The system of money which admits both gold and silver to coinage at a fixed relative value, and which regards them as having the same legal-tender value is called *Bimetallism*. Up to the time of the Civil War, the bimetallic system was the legal system in the United States. In 1873 the gold standard was recognized by law. Silver coins are used, but are not coined upon the same terms as gold, and not all of them have the same legal-tender value as gold, hence the system is not bimetallic. It is claimed by the adherents of bimetallism that if a definite ratio of value were established by law between gold and silver that (1) the exchanges between nations would be simplified, and (2) that the price of commodities would fluctuate less, since the fluctuations in the prices of the latter are, so it is claimed, associated with the fluctuations in the value of silver. The question of bimetallism was the great issue in the presidential campaign of 1896, and the candidate who advocated that theory was defeated. Since that time discoveries of gold in great quantities have relieved the financial situation to such an extent that a change in the money standard is not urged with the same earnestness as formerly.

**Bingen** (*bĭng'en*), a picturesque old town of Germany, on the Rhine, in the grand duchy of Hesse-Darmstadt. Population of the commune, 8,187. Neighboring mountains, crowned with ruins, and an old bridge, dating back to the era of the Romans, increase the beauty of the place. Below the town is the famous Bingerloch or Bingen Hole, where the Rhine narrows into a strait between towering rocks. Above them, rises the Mäusethurm or Mouse-tower in the middle of the river, where, in the 10th century, Bishop Hatto, of Metz, collected toll from all passing vessels, and where he himself was finally eaten alive by mice attracted to the tower by the grain he had stored away in a time of famine. In popular legend it was near Bingen that the treasure of King Nibelung, which gave its name to the Nibelungen-Lied, was sunk in the Rhine.

**Bing'hamton,** the county seat of Broome County, N. Y., lies on both sides of the Susquehanna River, at the mouth of the Chenango River, and both rivers are spanned by several bridges. It is an important railroad town, and has more than 300 manufacturing establishments, the leading ones being furniture, glass, gloves, scales, leather, boots, shoes and cigars. It takes third rank in the U. S. in the last named industry. Among its noted buildings are the U. S. government building, the state armory, the state insane asylum, two orphan asylums, etc. The use of anthracite coal has kept the city clean and free from smoke, earning it the title of the parlor city. Population 55,901.

**Biology,** a subject of great interest and importance, not only to scholars and medical men, but to all intelligent people who care for living nature. All questions in regard to the living world belong here. An animal or plant is wonderfully constructed, but, after all, the most wonderful thing about it is that it is endowed with life. While it is interesting to observe the structure of animals and plants, it is even more interesting to learn the purpose of the structure and to determine what is taking place within their bodies, what has been their past history, how they behave in reference to their surroundings, etc. This is, of course, very difficult; it requires observations with and without the microscope, experiments, and the use of the best powers of the mind.

Biology is an attempt to analyze the activities of life and finally, if possible, to give an explanation of the same. It is one of the natural sciences and is related to many branches of learning. It is easily separated from physics and chemistry, both of which deal with lifeless matter, but is is closely connected with natural history, medicine, physiology, botany, zoölogy, psychology and with many affairs of every-day life.

Biology in its modern sense is of recent origin. It is customary to consider it as having taken rise about 1860, but in order to understand the reason for this way of looking at the matter, it will be necessary to trace the growth of the subject. It is

a long story, reaching over several centuries, but it can be briefly told.

Among the ancient Greeks observations directly upon animals and plants led to many facts of natural history. Aristotle (384-322 B. C.) is the best representative of the knowledge of his time about life. But after a few centuries the mind of mankind was turned away from nature. In due course of time, there was a complete arrest of inquiry into all things relating to the external world.

During this period, other branches of learning might make a little advance, but the knowledge of nature suffered the most, because we cannot know anything about natural phenomena without turning the mind outward and making direct observations upon the external world Therefore, it was an epoch of great importance when men began again to observe, to use their eyes, and to turn to the great world of nature outside themselves. The men who started independent observations deserve much credit, for the authorities of both church and state were unfriendly to unbiased inquiry, and they went against every motive of self-interest in becoming pioneers in the new intellectual life. Vesalius (see ANATOMY), Galileo and Descartes were among the reformers in the 16th century, and in the 17th century the work of Malpighi, Swammerdam and Leeuwenhoek is worthy of especial mention. Their great work consisted chiefly in this, that "they broke away from the thraldom of book-learning, and, relying alone upon their own eyes and their own judgment, won for man that which had been quite lost, the blessing of independent and unbiased observation."

Thus awoke again the good spirit of inquiry and thereby the foundations of modern science were laid. When attention was turned to animals and plants, the first things noticed were, of course, the simplest and most obvious: external form, color, habits. This is the period in which the organism was studied as a whole, for each plant and animal is an organism. The naturalist of the time knew relatively little about the internal structure of animals and plants but many general facts about them. Linnæus and Ray represent this level of knowledge. For them, the study of nature consisted in observing and collecting widely, grouping or classifying animals and plants, learning about their habits, etc. Linnæus made an epoch by introducing a method of naming plants and animals by giving to each two names—a generic and a specific name. This made knowledge more definite. He used Latin, which was the language of science, and, as his method was universally adopted, the same name came to apply to the same animal or plant in all countries. This directed the attention of naturalists to species or particular kinds, and thereby prepared the way for the discussion of the origin of species, which is the fundamental question in the doctrine of organic evolution.

But another advance was to come. The next natural step after the study of the organism as a whole was to think of its architecture or the way in which it is constructed. Men began, therefore, to observe the organs or parts that are united together to make up animals and plants. This was a study of internal structure. The construction of animals was studied very widely and they were compared with one another, so that there arose the new science of comparative anatomy (see ANATOMY) of which Georges Cuvier (1769-1832) was the founder. Similar work was done for plants by Jussieu. But knowledge of nature was becoming so much extended that it was necessarily subdivided, and investigations into the uses of the organs were being made by physiologists like Haller and J. Müller (see PHYSIOLOGY) at the same time that structure was being studied by the anatomists.

The next step was based on the observation that organs are composed of simpler parts called tissues. Often several different kinds of tissue will unite into one organ; for example, the heart is not all muscle but connective tissue and nerves enter into it; the walls of the stomach also contain glands, muscles, nerves, connective tissue, etc., all united to form the one organ—the stomach. The leaf of a plant is not all one kind of tissue, but several different kinds enter into it. We are thus approaching step by step the finer structure of living beings. Bichat (1771-1802) studied the tissues extensively, and at the beginning of the 19th century laid the foundation of microscopic anatomy or histology.

The next step was based upon the perfection of the microscope. This instrument had been introduced, in a crude form, into natural history in the 17th century, and had opened a new world to naturalists. About 1840 great improvements were made in manufacturing the magnifying glasses for the microscope, and observers began gradually to see that the tissues are not the simplest parts of animals and plants, but that tissues are composed of very small units or particles, brought together and built into the tissues as bricks might be fitted together into a building. This idea took definite form about 1839-40, principally through the observations of two men, Schleiden and Schwann. The former was a botanist, and he came to the conclusion that all the parts of plants are built of little box-like compartments or cells. The latter, his friend, was an anatomist and zoölogist, who, from his studies with the microscope on animals, reached

similar conclusions. This great discovery unites all animals and plants on a broad plane of similitude of structure. It is known as the cell theory, and has done much toward unifying the knowledge of animals and plants. This, taken in connection with the fact that all animals and plants arise from a single cell, has great meaning. The discovery that the egg of all animals is a single cell, shows that the starting-point is one of the single bricks of organic architecture, which by successive divisions gives rise to all the others that enter into the construction. Plants also proceed from a single cell. These are among the most remarkable facts in all nature. In its original form, however, the cell theory was very imperfect. Both Schleiden and Schwann supposed that the cell wall was important, and looked upon the cells as little box-like compartments. This had to be changed by later students, and the cell theory was reformed and modified into the protoplasm theory.

The progress, thus far, had brought out the facts that cells are joined to make tissues, the tissues to make organs, and organs to make the organism, but there was one further step to be taken to bring this line of advance to its proper goal. It was soon discovered that the cell wall of cells is not important, but that the jelly-like viscid fluid within is the substance that is actually alive. This substance is the seat of all life and is called protoplasm (see PROTOPLASM). We see that observations began on the outside and led by a series of steps to the true seat of life, just as a flight of stairs uncovered by some good genii in the old fairy tales, led from the surface to a treasure cavern, but it took a good many years for naturalists to take each step. Max Schultze, in 1860, placed the ideas about protoplasm on a firm basis, and from that time dates modern biology, which is all about this living substance—what it is like in its various manifestations what it is doing, and what it has done in the world.

Therefore, a great deal of the work of the biologist is the study of this living substance at first hands. He can place under his microscope the simplest plants and animals, and if they are translucent enough to let the light through, he can see many things that are taking place within the protoplasm. One of the common organisms of great interest to biologists is the amœba—a simple microscopic particle of living jelly in which the processes of life are reduced to their simplest expression, and it meets all the requirements for observation. This organism is really an animal and a single cell, and, therefore, it lies near the bottom of the animal series.

By suitable experiment and observation it can be shown that the amœba, simple as it appears, is really very complex, on account of the powers and activities which it exhibits by virtue of being alive. A list or catalogue of its activities will be the same as those occurring in the various tissues and organs of higher animals. Therefore, we have in it the germ of all the activities of the higher creation. Its body is a little mass of protoplasm, and anything determined about it holds good for protoplasm. This substance is the only one in the world that is endowed with life, and biologists have come to the conclusion that it is practically identical in plants and animals, but at the same time exhibits a wide range of variations and differences, not in kind, but depending on the degree of perfection and specialization.

Protoplasm has properties which, taken together, distinguish it absolutely from every form of non-living matter. These are: (1) its chemical composition; (2) its power of waste and repair and of growth; (3) its power of reproduction. Other substances are simpler in composition than protoplasm, in fact, it is the most complex substance in the universe. Common chemical elements like carbon, hydrogen, oxygen, nitrogen, sulphur and phosphorus, enter into it, but they are combined in a very much more complex manner than in any other substance, and they are all present at the same time. Living matter is also continually undergoing a process of breaking down, by a sort of internal combustion, and making good the loss by the manufacture of new protoplasm out of the simpler food particles. It also has the power of growth, and "lastly, living matter not only thus repairs its own waste, but also gives rise, by reproduction, to new masses of living matter; which, becoming detached from the parent mass, enter forthwith upon an independent existence."

"We may perceive how extraordinary these properties are by supposing a locomotive engine to possess like powers: to carry on a process of self-repair in order to compensate for wear; to grow and increase in size, detaching from itself at intervals pieces of brass or iron endowed with the power of growing up step by step into other locomotives capable of running themselves, and of reproducing new locomotives in their turn. Precisely these things are done by every living thing, and nothing like them takes place in the lifeless world." —Sedgwick and Wilson, *General Biology*.

The higher animals, all of which are many-celled may be looked upon as combinations of amœba-like elements, variously modified and built into the tissues. In passing from the condition of a single cell to that of many there has been not only an increase in the number of cells, but there has been also a physiological division of labor, so that particular groups of cells

have been set apart to perform a certain particular round of duties, while other cells have been set aside for other work. For example, the protoplasm of certain cells has become very contractile and forms the muscles; in certain other cells the protoplasm has become highly irritable and responsive, and makes the nervous tissues; and so on for the other groups. This physiological division of labor has led to the different tissues.

Plants show very nicely the gradations between the single-celled and the many-celled condition. There are first linear aggregates, in which the cells are united end to end in a single row. The next step is groups of cells arranged in a single layer to form an expanded surface; and finally the combination of cells into a solid mass having length, breadth and thickness.

In biology, animals and plants are considered from a variety of view-points: as to their *Structure*, or the way in which they are constructed (see ANATOMY); as to their *Development*, or the stages through which they pass from the egg or seed to the adult (see DEVELOPMENT); as to their *Physiology*, or the uses of the different organs and the changes that are taking place in the protoplasm of the tissues; as to their *Distribution*. Biology is, therefore, a complex science, and is the result of the concurrent progress in all these departments. It may be likened to a great stream into which a number of smaller streams have united to make the main one, and it contains mixed together the product of all.

The main divisions of biology are, of course, greatly subdivided; for example, under structure, we might consider animals and plants in reference to their surroundings, and show that the structural peculiarities are the result of responses to the surrounding conditions, and we might further show how likeness in structure indicates relationship, and is the basis upon which animals and plants are classified or arranged into systematic groups. Moreover, development and physiology are very extensive branches, and must be divided into smaller topics for practical consideration. In reference to the distribution of animals and plants, it must be said that it takes two directions: first, their geographical distribution, and, secondly, their distribution in time. The first will be clear without further statement, but the second requires a word. We know that there are entombed in the rocks countless numbers of animals and plants that lived centuries ago and became extinct. The succession of life in the rocks is very interesting, beginning as it does with the lowest forms, in the earliest formed rocks, and passing to the higher ones in the later formed rocks. In this succession of stages we can read the past history of life on the earth, and this has helped greatly in establishing the doctrine of organic evolution.

It is an indefinite line that separates biology from botany and zoölogy. Modern botany and zoölogy embrace all that is known about plants and animals respectively, but the plant kingdom and the animal kingdom are considered separately. In biology the facts are approached from a different standpoint, and the emphasis is differently placed. The phenomena of life are brought into union in both animals and plants, and the attention is especially directed to the activities of protoplasm, and its responses to surrounding conditions. General biology is a term in common use to indicate the consideration of certain general facts about animals and plants. It is recognized as a distinct branch, and frequently studies of these general topics are made to precede studies that are mainly botanical on the one hand, or mainly zoölogical on the other.

These facts should make clear how the department of biology arose and what it is about; but before leaving the subject we should at least glance at its 19th century features. The three things that most distinctly mark biological advance during the 19th century are: (1) The cell-doctrine (which see),—the discovery of the fact that, with the exception of unicellular forms, plants and animals are composed of groups of cells, and moreover, that they all begin their existence as eggs or ovules, in the single-cell condition. (2) The discovery of protoplasm (which see), and the recognition of the rôle it everywhere plays in animal and plant life. (3) The doctrine of organic evolution, or the discovery of the genealogy of animals and plants.

There are in addition other things to be mentioned: The great extension of knowledge in reference to microbes and bacteria (which see) has been characteristic. Advances in this direction have led to the discovery of the nature of fermentation, of decay, to the germ theory of disease, etc.; and have also brought in their train an unusual number of practical applications: antiseptic surgery, the canning of fruits and meats, infecting insects with disease to stop the ravages of the injurious kinds; and also the protection of silk-worm culture, etc.

The growth of information regarding the development of animals and plants has been very great, and has been turned to account in reading the past history of life.

The question of the spontaneous origin of life was revived in 1858. That is the belief that the simplest microscopic forms of life are sometimes formed, spontaneously, from lifeless matter. But it was

again answered in the negative, as it had been in the 18th century, and finally it was put to rest through the work of Pasteur, Tyndall and others.

In the latter part of the century experiments on living forms became prominent. The eggs, the larvæ and the older stages have been placed under different conditions of temperature, light, food, chemical and mechanical surroundings, and the effect of these changes watched. Many important facts have been brought to light by these experiments.

Biology is a body of rapidly expanding knowledge of intense interest and great service to mankind. Much was accomplished by it in the 19th century, but much more is to be expected in the 20th century.

For books about biology, see Sedgwick and Wilson's *General Biology*, Parker's *Elementary Biology* and Thompson's *The Science of Life*. Additional titles will be found under ANATOMY, BOTANY, ZOÖLOGY.

WM. A. LOCY.

**Birch,** species of the genus *Betula*, which consists of trees or shrubs, very widely distributed throughout the north temperate regions. The birches have usually a bark which separates in thin papery plates, and the long and pendulous catkins of flowers appearing in very early spring are well known. They grow in North America, Europe, North and Central Asia. Bailey states that no tree grows farther north than the birch. The Dwarf Birch is highly valued by the Laplander, furnishing him most of his fuel, and its tiny nut furnishing food for that bird so useful to the Laplander, the ptarmigan. The wood of many birches is inferior owing to the toughness of the bark interfering with the evaporation of the sap, its consequent fermentation and the crumbling of the wood. It makes excellent fuel; is used in manufacture, and is employed for furniture and small, common articles. Of the bark are made baskets, boxes, and that of the Paper Birch is extensively used for canoes; a dye is also made of it, and an oil which is used in the preparation of Russia leather. A number of birches are cultivated as ornamental trees, the weeping birch being extensively planted in this country. They are graceful of form, fair appearing from bark to least tremulous leaf. They are easily propagated by seeds and grow rapidly.

The American White Birch has a short life, but is a graceful tree and plucky one, springing up in deforested land and abandoned fields. It grows south as far as Pennsylvania. It is a small tree, from 25 to 45 feet high, the bark smooth and white, not readily peeling; foliage tremulous; dark green, triangular leaves, turning yellow in autumn. Recently the wood has come into value, found useful as wood pulp, for shoe-pegs and spools.

The Canoe Birch or Paper Birch is one of the largest and most picturesque of the birches, and is widely distributed throughout our northern states. It usually grows to a height of from 60 to 80 feet, sometimes reaches to 120 feet; its bark a conspicuous chalky white, which tears off readily in horizontal sheets. The leaves are large and broadly ovate. This, as the name suggests, is the tree so friendly to the Indians, giving them bark for their famous canoes, for their shelters, and for their household utensils, giving them fuel that quickly crackled and flamed: even giving them food, they making this use of the layer between wood and bark (cambium).

"And the tree with all its branches
Rustled in the breeze of morning,
Saying with a sigh of patience:
'Take my cloak, O Hiawatha!'"

The Indians to-day still make canoes of birch bark, baskets and various other articles thereof. The bark, as is well known, tears off in thin sheets of several layers, the thinner ones being frequently used as letter paper, a use of birch bark going back to ancient times. The peeling of the bark by careless hands, cutting too deep, results in the loss of many goodly trees, whose far-gleaming white columns have proved their undoing.

The Cherry Birch is a comely and useful tree also known as Sweet Birch and as Black Birch. It grows from 50 to 80 feet high, and is noted for its grace. The bark is dark brown, the leaves, from two to five inches long, are oblongovate. Early in the spring the Black Birch is all aglow with yellow catkins, is golden in the fall, and in the summer bears an abundance of glossy foliage. In the spring the wintergreen flavor of the saplings is very pleasant. The sap is made into birch beer, and from the inner bark are obtained salicylic acid and wintergreen oil. The hard, strong wood, of good red-brown color, is used for furniture, and for wheel hubs and fuel. The range of the tree is from Newfoundland to Ontario, south to Florida, Tennessee and Kansas. Other varieties are the Yellow or Gray Birch and the Red or River Birch. See Bailey: *Cyclopaedia of American Horticulture* and *The Tree Book* by Julia E. Rogers.

**Bird Day,** a day set apart for the purpose of interesting boys and girls in wild birds and in bird protection. The idea of Bird Day originated with Professor C. A. Babcock of Oil City, Pa., in 1894. Bird day was observed in Oil City in 1895. In some states Arbor and Bird Day are observed as a single festival.

**Bird Protection,** nature lovers had long been working for federal protection of birds, but the first distinct bird reservation was

made in 1903 at Pelican Island, Fla. Since then many others have been added and a national law passed for the protection of migratory birds. In 1916 a treaty with Canada brought the hunting season and protection afforded in the two countries into agreement.

**Birds,** a natural class of vertebrates. Other groups of equal value are Fishes, Amphibia, Reptilia and Mammals, each of which is called a class. Birds are distinguished from all other animals in that they possess feathers. They moult or change the feathers once a year. They are warm-blooded animals with a four-chambered heart; their lungs are connected with air-sacs, and the bones are often hollow with spaces which are connected with the air-sacs, to make them light for flight. Living birds have no teeth, but many fossil birds had teeth. The birds as a group are closely related to reptiles. There were, in geological times flying reptiles, and there is a bird (*Archaeopteryx*) found in the rocks of Bavaria that forms a connecting link between birds and reptiles. The largest living birds are the ostriches, but the great fossil birds (*Dinornis*) of New Zealand were from six to ten feet in height. There are several other extinct birds of very large size. In the world to-day there are between 13,000 and 14,000 species.

The best way to observe our common birds is with the help of opera-glasses. We should go into the fields and woods armed with opera-glasses instead of a gun. Quietly reclining under the trees, we may, with field-glasses, bring the birds near enough to see their colors and observe many of their habits. Besides their beauty, birds are highly useful, destroying numberless insects and acting as agents in cross fertilization and seed planting. A good book to help is Chapman's *Color Key to North American Birds.*

The modern classification of birds includes the extinct forms, and is too technical to give here, but the following arrangement may be found convenient: Our common birds are either (a) water birds or (b) land birds. The water birds include divers, swimmers, waders, and the shore birds, represented by loons, gulls, ducks, geese, swans, auks and pelicans, herons, storks, ibises, cranes, rails and snipes, sandpipers, woodcocks, plovers and killdeer.

The land birds are more numerous. Here the largest order is that of the perching birds, embracing many families and representatives, including most of the song birds. Flycatchers, kingbird, phœbe, larks, crows, jays, blackbirds, oriole, bobolink, meadow lark, cowbird, sparrows and finches, song sparrow, field sparrow, goldfinch, purple finch, rose-breasted grosbeak, swallows, waxwings, warblers, threshers wren, catkird, mockingbird, red thrush, creepers, nuthatch; the thrush family, blue bird, robin, hermit thrush, etc. Other families and representatives of the land birds are the scratchers: common fowl, turkey, pheasant, grouse, pigeons and doves; birds of prey: turkey buzzard, hawk, eagle, owl, cuckoos, kingfishers, wood-peckers, goatsuckers nighthawks, whip-poor-wills, swifts and humming birds. In addition to the above are the running birds; ostriches, emus, cassowaries.

See Chapman: *Bird-Life* (1899) and *Bird Studies with Camera* (1901); Davie: *Nests and Eggs of N. A. Birds* (5th ed., 1898); Coues: *Key to North American Birds;* Blanchan: *Birds Every Child Should Know; How to Attract the Birds* (1902); *Bird Neighbors* (1897); *Birds that Hunt and are Hunted* (1898); Dugmore: *Bird Homes* (1900); Merriam: *Birds of Village and Field* (1898).

**Birds' Nests** are primarily for rearing the young rather than for shelter. They show a great difference in architecture, from the most rude to the very complex, and birds may be divided into groups according to the way in which their nests are built. The mining birds either dig holes in the ground for their nests or use holes already dug by other animals. Thus the kingfisher digs a crooked gallery several feet into a bank and lays its eggs in a round hole at the end. Other birds of similar habits are the common bank swallow, the bee-eaters and the family of storm petrels. The wood-wren and the burrowing owl make their nests in ready-made burrows. Among ground-builders some build no nest at all, others only occasionally. The nighthawks lay their eggs on bare ground, as a large number of sea birds do on the sand. The brush turkeys of Australia, called mound builders, gather a large heap of decaying leaves and grass, and when the heap has become warm from rotting, dig a hole about two feet deep in the top, and lay their eggs, leaving them to hatch out by the heat. Vultures and common fowls belong to this group. The masons build their nests with walls or sometimes only coverings of mud. The cliff swallows build flask-shaped nests against the sides of rocks or cliffs. Several birds usually work at one nest, bringing mud, while one of their number directs the work from within. The baker bird of South America is the most skillful of this class. It builds its nests very high, in the shape of a baker's oven, with an entrance on the side twice as high as it is long, and the interior divided into two chambers by a partition. The common robin is allied to this group. The carpenters bore holes for their nests in trees. The woodpeckers, for example, dig with their beaks a short tunnel upward and then a larger hole downward, in the middle of the tree, where the eggs are laid. The platform builders include the eagle and pigeon. The level platforms of branches of trees and sticks built by eagles

are strong enough to hold the weight of a man. The basket-makers form a very large class. The mocking bird and the red-winged blackbird are familiar examples. A family of grosbeaks build a large, basket-like cluster of nests, sometimes as many as 800 in a single group. The weavers include the orioles, etc. The social weavers of Africa join together and build in tree-tops large grass canopies shaped like umbrellas. Among tailors is the bird of India, which usually makes its nests by sewing a dead leaf to a living one, making a sort of pouch, which is filled with fine down. The felt-makers, as the canary bird, build a closely woven nest, arranging the material like the fibre of felt. The nest of the hornbill is a hole in a tree, in which the female is made a prisoner during the period of incubation. She is locked up in the nest, by plastering the entrance, leaving only a small hole through which she is fed by the male. As interesting a bird structure as any is that of the swift, which makes the nest so highly prized by the Chinese, in bird's-nest soup. See Davie: *Nests and Eggs of North American Birds;* Dugmore: *Bird Homes.*

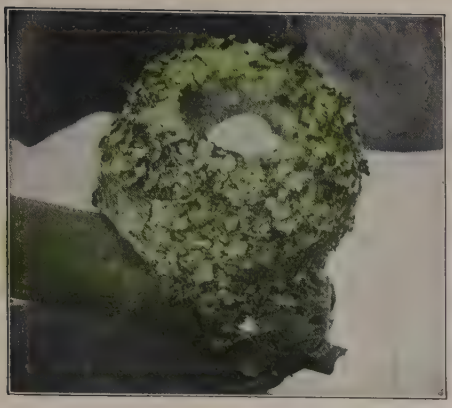
**Birds-of-Paradise,** the name given to an Australasian family of birds of very brilliant and varied plumage, no bird its rival in splendor. The history of the name is interesting. The early voyagers to the Moluccas were shown dried skins of these birds from which the feet and wings had been removed, and for several centuries thereafter, no perfect specimens were seen in Europe. About the year 1600, they came to be known as birds-of-Paradise. One writer of that period tells us that no one has seen these birds alive, for they live in the air, always turning toward the sun, and never alighting on the earth till they die, for they have neither feet nor wings. Even Linnæus, in 1758, named the largest kind the footless Paradise-bird, as no perfect specimen had been seen in Europe. During 1854-62 Alfred Russel Wallace was in the Malay Archipelago and was the first naturalist to observe these birds in their native haunts. They are now very common in museums, and some kinds are used in trimming ladies' hats, certain species having almost been exterminated owing to the milliners. Some are caught in snares, others are shot with blunt arrows by the natives.

There are twenty-five or thirty species of these Paradise-birds, including the great bird-of-Paradise, the largest kind, about eighteen inches from beak to tip of tail, the lesser bird-of-Paradise, etc. The males alone have brilliant and gorgeous plumage; the females are plain. Associated with the more brilliant kinds, in the same family, are the bower birds of Australia and New Guinea. They are all related to the crow-family and vary in size from that of the crow to that of the sparrow. The plumage is not only of great brilliance but also of the richest velvety appearance. In many species there are numerous long tufts of feathers that start from the shoulders and spread out and down in wondrous fashion. These are the prized bird-of-Paradise plumes used by the milliners. The various species show varied gorgeousness; the Paradise Minor is golden above with throat and top of head a metallic green, coppery red below, and with copper-red wings and tail, a great swirl of golden and white plumes completing its splendor; the King Bird is a glossy crimson above, divided by a band of metallic green about the throat from the white below, and has a fan of ashy plumes tipped with emerald. See Wallace: *Malay Archipelago.*

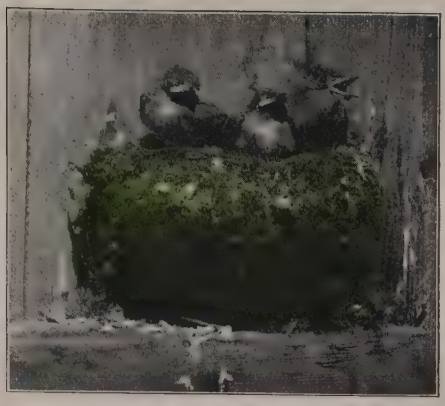
**Birds of Passage** are birds which are migratory, passing regularly with the seasons from one climate to another. Birds which breed in the United States and go south in the fall, returning to the north in the spring, are called summer birds of passage, while the wild geese which breed in the Arctic regions and visit the United States in autumn, flying north again in the spring, are winter birds of passage. Most of the migratory birds of the western United States pass the winter in Mexico. Birds of the eastern states winter in the south, West Indies, Central America and even (Bobolinks) in Brazil.

**Birkenhead,** an English seaport in Cheshire, on the left bank of the Mersey, opposite Liverpool. The population, 130,832. It dates back to the 12th century, but has gained its present importance within recent years. It has several fine parks, one being 180 acres in extent, and a number of public buildings, such as a free library and public baths. In its neighborhood is St. Aidan's College. There is communication across the Mersey by bridge, by ferry and by a railroad tunnel, 1,230 yards long, which was opened in 1886. The docks are united with those of Liverpool. For some years Birkenhead has been noted for its shipbuilding yards, where have been built some of the largest iron ships afloat.

**Birmingham** (*ber' ming-um*), a city in Alabama, founded in 1871 and called the Magic City of the South. It is situated in Jones Valley, from which rises Red Mountain, and is the capital of Jefferson County. It is close to almost inexhaustible supplies of iron ore, coal, limestone and oil, and promises to rival Birmingham, England, and to become the greatest metal-workers' city in America. It has large rolling mills, which manufacture rail and bar iron, plate and sheet iron, steel and rail mills, and by-product plants, factories for making ice, glass, bridges, chains, steel cars, etc. Twenty-five furnaces in or near the city are now engaged in making iron. One company employs 3,500 men and has a capital of nearly $4,000,000. The red ores found in enormous quantities in the region, make an excellent



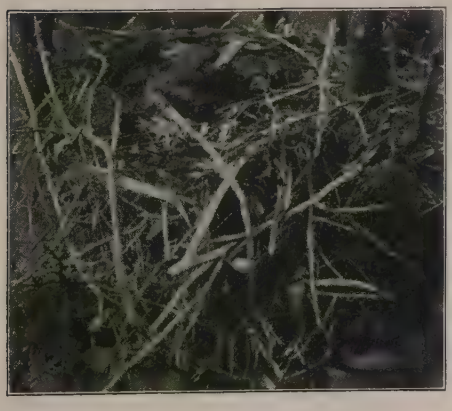
HUMMING BIRD'S NEST.



PHOEBE'S NEST BUILT ON A BEAM.

WORM-EATING WARBLER'S NEST.

BLUE JAY'S NEST



CROW'S NEST WITH YOUNG NEARLY READY TO FLY.

WOOD THRUSH ON NEST

VESPER SPARROW'S NEST

NEST OF YELLOW-WINGED SPARROW.

REED-WARBLER'S NEST BETWEEN THREE REED STEMS.

WOOD PEWEE'S NEST.

WARBLING VIREO'S NEST.

WHITE-EYED VIREO ON NEST.

quality of steel, and the annual output is now very considerable, giving employment to many thousand hands. Ten railroads center here and fine buildings are numerous. The city has fine schools and churches, including among its public buildings a handsome court house, a $200,000 high school building and many other fine civic institutions. Other agricultural examples of architecture include the great Union Station, the building occupied by the First National Bank and St. Vincent's Hospital. Near by, at East Lake is Howard College, a Baptist institution and three miles west of the city is Birmingham College, the Methodist institution of the state. Electric trains give access to the city's growing suburbs, which have a combined population greater than the city; it also has an excellent system of water-works. The population is 174,108, while in 1880 it was only a little over 3,800, and in 1870 was a cotton field. In short Birmingham is one of the most striking examples to be found of the wonderful commercial development of the New South.

**Bir'mingham,** an English manufacturing city in Warwickshire, famed for its metal works, is situated near the center of England. From an early period it has made all kinds of metallic articles. The chief variety is the brass-working trade, in which 10,000 people are engaged. The next in importance is the manufacture of jewelry, gold, silver and gilt; then come small arms of all sorts. Other specialties are buttons, hooks and eyes, pins, screws, nails, steel pens, electric-plating and bell making. About 20,000,000 steel pens are made every week, and Birmingham has the monopoly of the screw trade in England. There are a large number of fine buildings, such as the City Hall, where musical festivals are held every three years, and great political gatherings, for which the place is famous. Mason and Queen's Colleges are situated here, together with several art galleries and libraries. A large number of fine statues adorn the place, among them those of Lord Nelson and Sir Robert Peel. The famous Soho works, founded by Watt and Boulton, where the first engines were made, are near Birmingham. The city is divided into seven districts, each of which returns a member to Parliament. The population, 570,113.

**Bisbee,** a city in Cochise County, Arizona, about thirty miles from Tombstone, is situated in a cañon of the Mule-Pass Mountains, and is a substantially built modern city. Noteworthy buildings are the Y. M. C. A., Y. W. C. A. library, the high and central schools. Bisbee has an admirable public-school system and several fine churches. Its copper mines are among the richest in the world, and the two of greatest importance are known as the Calumet and Arizona and the Copper Queen. The city has electric light, waterworks and an electric street-car system; also the service of the El Paso & Southwestern Railroad, by which it is connected (at Tucson) with the Southern Pacific. Bisbee, inclusive of its suburbs, has a population of 21,000.

**Biscay** (*bĭs'kā*) **Bay of,** an eastern arm of the Atlantic, extending from Ushant Island to Cape Ortegal, and flanked on the east by France and on the south by Spain. It is about 350 miles long by 300 miles in width. Violent circular currents, as well as storms, make the navigation difficult. The Spanish coast is rocky, but the French coast is low and sandy. The depth varies from 20 to 200 fathoms. The principal ports on the French coast are Bayonne, Bordeaux, Nantes, Rochefort, La Rochelle and Brest; those on the Spanish coast are Santander, San Sebastian and Bilboa. The Rivers Loire and Garonne flow into the bay.

**Bismarck** (*bĭs'märk*) **Archipelago,** is made up of what was formerly called the New Britain Archipelago, the Admiralty Islands and several other groups lying to the north and east of Kaiser Wilhelm's Land or German New Guinea. The white population in 1909 was 474, of whom 364 were Germans. The imports in 1910 amounted to 2,914,792 marks; the exports to 3,224,027, chiefly copra, with some cotton, coffee and kapok, a sort of cotton. About 170,000 acres are under cultivation.

**Bismarck, N. Dakota,** since 1889 capital of the state, on the Missouri River. Four federal buildings are located here—an Indian school an army post. a weather bureau and a modern building containing the new post office, the land office and the federal courts The state buildings are the capitol and the penitentiary. The city has good grammar schools, a model high school, ample fire and police protection, good sewerage and well lighted streets. Sixteen wholesale houses have their home offices or branches here and there are three excellent banking institutions. It has the service of two railroads. The site of the town was visited by the explorers, Lewis and Clarke, but it was not until after 1875 that it was incorporated. Population, 5,443.

**Bismarck, Otto Edouard Leopold von, Prince,** one of the greatest of modern statesmen, was born at Schönhausen, in Brandenburg, April 1, 1815, of an old and distinguished family. Educated at Göttingen, Berlin and Greifswald, he lived for awhile on his estates; but in 1847 entered politics as a member of the first Prussian parliament, where he sided with the conservatives. From that time forward he was the great champion of a united Germany, with Prussia at its head. He was sent as minister to St. Petersburg and Paris; and in 1862 was appointed minister of foreign affairs and prime minister. His policy was strongly opposed by the liberals, and for awhile he became very unpopular. At this time the

rivalry between Austria and Prussia stood in the way of the reunion of Germany as a nation, and so Bismarck hurried on a war between these two powers which (1866–67) ended in forming the North German Confederacy, with Prussia at its head, and Bismarck as chancellor. In 1870, during the war with France, he was wont to accompany the army and King William, and was present on many battlefields and at the siege of Paris, while he negotiated the treaty of peace in 1871. Bismarck received the title of prince and was made chancellor of the new German empire. From that time his whole energy was given to putting the empire into good condition within and securing it from attack without. His social measures won for him the designation of the greatest state socialist of the age, and his efforts to keep peace in Europe by an alliance against Russia and France, earned him the titles of the Peacemaker and the Peacekeeper of Europe. He was also called the Iron Chancellor, and, from his own words in a speech, the man of blood and iron. Though not a smooth orator, Bismarck had great power in the use of his native tongue, and his speeches were always strong and effective. He made many enemies and his life was frequently in danger. He was, however, a great national hero and his birthday, while he lived, was several times celebrated by the whole nation. During the brief rule of the Emperor Frederick, Bismarck retained his power, but the strong opposition to his plans by the present Emperor William led him to resign. He latterly lived in retirement on his estate. Prince Bismarck was tall and of an imposing presence, and had a piercing eye. Though imperious and even unscrupulous as a statesman, yet in private life he was genial, witty and entertaining. He died at Friedrichsruh, July 30, 1898.

PRINCE BISMARCK

**Bismuth,** a hard brittle metal having a bright metallic luster and a distinct reddish tinge of color. It melts at 518°, and expands, as water does, when it solidifies. It is used for making very fusible alloys. One of these, known as Wood's metal, consists of two parts bismuth, two parts lead, one part tin and one part cadmium, and melts at 141°, a temperature that can be borne by the hand. Basic bismuth nitrate, frequently called sub-nitrate of bismuth, is extensively used in medicine. The greater part of the bismuth comes from Saxony.

**Bison,** wild cattle, related to the ox, living in Europe and North America. The European bison was common in Europe in the times of ancient Rome, but is now confined to a few herds in the Caucasus and Ural Mountains. The European form eats buds, shoots and bark. When it was abundant, it did much harm in the forests. The true buffalo belongs to India and South America. In appearance the bison differs from the true buffalo in the high hump on its shoulders, the long hair with which the head is so heavily clothed, the heavy barb, and the fringe of long, coarse hair on the forelegs

The American bison, popularly called buffalo, is the most famous of our hoofed animals. Once buffalo were almost unbelievably abundant here. In comparatively recent days herds derailed trains in the west and stopped boats on the Yellowstone and Missouri Rivers. Toward winter they migrated in an enormous company southward on their range, herd upon herd uniting. Various authorities repeat the story told of Col. Dodge's experience while traveling in Arkansas in 1871: "For twenty-five miles he passed through a continuous herd of buffalo;" the number estimated at 4,000,000. To-day there are probably less than 3,000 to be found in Canada and the United States together; this remnant saved in private preserve, public park and garden, in a desolate region in Canada southwest of Great Slave Lake, on the Flathead Reservation in Montana and in the Yellowstone National Park. In Corbin Park in New Hampshire there is a notable herd of pure-breed animals. The Oklahoma national forest also is a preserve for the rearing of buffalo. The range of the American bison was once 3,000 miles from north to south, 2,000 miles from east to west; in their migrations they climbed great mountains and swam mighty rivers. Their food was the herbage of plain and prairie. Vast expanses of land were marked by "buffalo paths," and still today the "buffalo wallows" show how hosts of these great creatures sought relief from flies and insects. They were indispensable to the Indian, furnished him with his chief subsistence. He dried great quantities of the meat and made use of the hide for shelter, clothing, boots and many other purposes—nothing was thrown away, the dried dung served for fuel.

The bison begins to shed its hair in March, shortly becomes quite bare, and to protect itself rolls in muddy sloughs until caked in an armour of mud. The new coat is fine by October, and at its best in November and December. The fur is valuable, the hide makes excellent leather.

and the meat is edible, almost like beef. A naturalist once shot a great animal that measured ten feet in length, its estimated weight 2,000 pounds. When at its best the American bison is of very splendid appearance. Hornaday thus describes one in perfect pelage: "The magnificent dark brown frontlet and beard of the buffalo, the shaggy coat of hair upon the neck, hump and shoulders, terminating at the knees in a thick mass of luxuriant black locks, to say nothing of the dense coat of fur upon the body and hind quarters, give to our species a grandeur and nobility of presence which are beyond all comparison with ruminants."

Greed brought to an end the life of this noble and most useful creature. Settlers coming in restricted the range and also ruthlessly slaughtered; sportsmen wantonly killed; and droves of hide-hunters had their full share in the extermination. See Hornaday: *American Natural History;* Stone and Cram: *American Animals.*

**Bittern** (*Botaurus Lentiginosus*), a nocturnal bird allied to the herons, widely distributed over North America and frequently found in marshy or reedy places in the eastern continents as well as in Australia. In size it varies from two to three feet in height, with a bill about three inches in length, and an expanse of wing close upon four feet. In its marshy haunts, it feeds at night on water-insects, fish, lizards and frogs. In the spring especially, at the breeding season, its notes have a bellowing, booming sound. Nesting on the ground, their eggs have a plain olive-green color, the birds themselves having a purple-brown tint, with occasional buff streaks on throat, breast and belly. They are very solitary in their habits, as well as shy and retiring.

**Bitu′men,** a general name applied to a variety of substances occurring beneath the earth's surface, and consisting principally of carbon and hydrogen, though often containing a little oxygen, nitrogen and sulphur. Natural gas represents one extreme of the bitumen series, and solid asphalt the other. Between these extremes are naphtha, petroleum, mineral tar, etc. Bitumen is very widely distributed, though its occurrence in quantities sufficient to make it commerically valuable is relatively rare. See NATURAL GAS, PETROLEUM, ASPHALT.

**Bituminous Coal.** See COAL.

**Björnson** (*byĕrn′ sŭn*), **Björnstjörne,** a celebrated writer of Norway, was born Dec. 8, 1832. While studying at the University of Christiania, he conceived a passion for the theater, and began his career as a writer by an historical drama. A few years later, when in Copenhagen, he published his beautiful story, *Synnöve Solbakken,* which at once became popular and marked an epoch in Norwegian literature. Soon after, he was made manager of the National theater in Bergen by its proprietor, Ole Bull. He published a series of national dramas from subjects taken from the old Norse sagas or legends. After a few years spent in Rome, Germany and France, he returned to Norway. The parliament voted him a yearly "poet's salary," so that he was free to devote his time to writing. He became director of the Danish theater at Christiania, and editor of the *Norse People's Journal.* He also took an active part in politics, and came to be an eloquent speaker. In 1881 he visited the United States, studying the workings of republican government and lecturing to his countrymen in the western states. Among his works are the so-called saga tragedies, *Limping Hulda, King Sverre, Sigurd Slembe* and others. The play, *Mary Stuart in Scotland,* is the only one taken from foreign history. Among his novels are *The Fisher Maiden, Arne, In God's Way, The Heritage of the Kurtz* and *The Bridal March;* he has also written shorter tales and poems. His later works dealt mostly with society and social reforms; among these are *The Editor, The King, A Bankruptcy* and *The New System.* Died April 26, 1910.

BJÖRNSTJÖRNE BJÖRNSON

**Black, Jeremiah Sullivan,** American jurist and statesman, was born in Pennsylvania in 1810, and died there Aug. 19, 1883. In politics he was what is known as a Jeffersonian Democrat, and was prominent as a lawyer, taking part, at one period of his professional career in the Vanderbilt will contest. In 1851 and again in 1854 he was elected one of the supreme court judges of Pennsylvania, and from 1857 to 1860 he was attorney-general in President Buchanan's administration, and afterward (1860–61) was secretary of state. In the latter year (1861) he retired from public life.

**Black, William,** a British novelist, was born at Glasgow in 1841, where he was educated and studied art. He was, however, led to writing, and did his first work for a Glasgow newspaper. He afterward went to London, where he wrote for several magazines. During the war between Prussia and Austria, in 1866, he was war correspondent for the London *Morning Chronicle.* He was afterward editor of the *London Review* and

assistant editor of the *Daily News*. In 1875 he abandoned journalism and devoted himself to writing fiction. He visited America in 1876. *A Daughter of Heth* was Black's first really successful work, and *A Princess of Thule* is perhaps his finest romance. Other works are *Strange Adventures of a Phaeton*, *Madcap Violet*, *Macleod of Dare*, *White Wings*, *Sunrise*, *Shandon Bells*, *Judith Shakespeare* and *Strange Adventures of a Houseboat*. He died at Brighton, Dec. 10, 1898.

**Black'ader, Alexander Dougall,** B.A., M.D., M.R.C.S., has been lecturer on the diseases of children since 1883, and professor of pharmacology and therapeutics in McGill University, Montreal, since 1891, where he received his earlier education, afterward studying in London Vienna and Prague. He is a member of many learned medical societies in Canada and the United States, and is the author of numerous articles and of the *Reference Handbook of the Medical Sciences*.

**Black'berry.** Certain species of the genus *Rubus*, belonging to the rose family. The blackberry is distinguished from the raspberry, which belongs to the same genus, by the fact that the receptacle remains with the druplets when the fruit is picked. It seems that the fruit is known in commerce only in America. Although it has been a well-known wild fruit from the earliest settlement of this country, it has recently been developed as a garden fruit.

**Blackbird,** a common name for a number of birds of black plumage, some of them only distantly related. In America several birds receive this name. The crow-blackbird or purple grackle is one of the common blackbirds; it lives in flocks. The rusty blackbird is less common. The red-winged blackbird is abundant in swamps and marshes of the United States. It is, really, a starling. The common blackbird of Great Britain and Europe is the merle; it is closely related to the American robin, which it resembles in form and habits, but is, of course, black. It is a true thrush.

BLACKBIRD

**Black'burn,** a manufacturing town in Lancashire, England, twenty-one miles northwest of Manchester. Its population is over 133,064. Its importance dates back to the 17th century. Its chief industry now is cotton manufacture, in which it leads the world, having a large number of cotton factories, many of them employing from 1,000 to 2,000 hands. Among the improvements in the machinery for spinning cotton which are traced to Blackburn is the spinning jenny, invented in 1707 by James Hargreaves, a native of the town. The chief public buildings are the town hall, the Gothic exchange and the infirmary. It has a grammar school, founded by Queen Elizabeth in 1567. Blackburn sends two members to Parliament.

**Black'feet,** a tribe of Indians of the Algonquin family, living in the states of Montana and Wyoming, on the eastern side of the Rocky Mountains, between the Yellowstone and the Missouri River, and also in northwestern Canada. They number about 6,000 in Canada, and 7,000 in Montana and Wyoming. They are divided into the *True Blackfeet*, the *Bloods*, the *Pigeons* and the *Small Robes*. In the early days of the west they were a powerful tribe, given to robbery and hostile to the whites, but have been friendly and peaceful for a number of years, though in 1865 they were involved in troubles with miners. In 1870 a large number were massacred. They differ from the other Algonquin tribes in worshiping the sun instead of the Great Spirit. A brief vocabulary of their dialect has been published by George Catlin in his *North American Indians*. They must not be confounded with the Blackfeet Sioux.

**Black Forest,** a wooded mountain chain in Baden and Württemberg, running northeast and southwest along the course of the Rhine. The chief rivers rising in it are the Danube and the Neckar. The loftiest elevation is reached in the round-topped Feldberg, and is 4,903 feet high, above the narrow valley of Höllenthal, connected with Moreau's famous retreat in 1796. The Kaiserstuhl or Emperor's Chair is a great mass west of the main chain. Its numerous valleys are beautiful. The legends of many centuries cluster around the whole region. Silver, copper, cobalt, lead and iron are found, and the mineral waters are famous, especially those at Baden-Baden. Some farming is done, but cattle rearing and the manufacture of wooden articles, such as clocks, musical boxes and toys, form the chief industries. Of these articles, 600,000 are exported yearly to all parts of the world. A railroad encircles the forest, and numerous lines cross it. The engineering has been very difficult, the line between Freiburg and Neustadt rising in elevation 2,000 feet in twenty-two miles. The region forms a district in Württemberg, Germany, area, 1,844 square miles, with a population of 541,662, largely Protestant.

**Black Hawk,** a famous Indian chief of the Sac and Fox tribe, was born about 1768 on the east shore of the Mississippi, near the mouth of Rock River. When about twenty years old, he succeeded his father as chief of the Sacs. In the War of 1812, he took part with England. When the remainder of the tribes removed to their reservation across the Mississippi, Black Hawk, with his followers, remained. Some years after, war began with the whites, and after a number of the whites had been massacred, the Indians were driven to the Wisconsin River and twice defeated, and Black Hawk was captured. A treaty was made, and the Indians were removed to the region near Fort Des Moines. Black Hawk and his two sons were taken as hostages through the cities of the East. They were confined for a time in Fortress Monroe, but were allowed to rejoin their tribes in 1833. Black Hawk died in Iowa in 1838.

**Black'heath,** an open common of seventy acres in extent, in the county of Kent, England, seven miles from London. Many schools are situated here. It is famous in English history. Here were the insurrections of Wat Tyler, of Jack Cade and of the Cornishmen under Lord Audley; here the Danes encamped in 1011; here the Londoners welcomed Henry V from Agincourt; and here Charles II on his way from Dover met the army of the Restoration. It was, for a long time, a noted place for highwaymen.

**Black Hills,** a range of mountains in South Dakota and Wyoming, about 100 miles long and 60 miles wide, or an area of about 6,000 square miles. They are a continuation of the Big Horn and Snow Mountains, which branch off from the Rockies. The highest point is Laramie Peak, in Wyoming, nearly 8,000 feet above sea-level. About one third of the area is covered with vast forests of black pine, giving the name to the mountain range. Gold has been discovered and extensively mined in the Black Hills, and other mineral wealth is believed to be abundant. The value of the mineral products of South Dakota in 1905, which were chiefly gold, was close upon seven million dollars; though this is a large falling off from the era of the seventies, when the region was opened to settlement. Harney Peak is the most elevated point in the Black Hills, reaching an altitude of over 7,200 feet.

**Black'more, Richard Doddridge,** a well-known novelist, was born in Berkshire, England, in 1825, and graduated at Exeter College, Oxford. He studied law, and was called to the bar, but practiced only a short time. He was fond of gardening, and so, in his novels, his descriptions of nature are his best efforts. With the exception of *Lorna Doone, a Romance of Exmoor,* his works lack movement and life. *Lorna Doone* however, is considered one of the best romances in the English language. Other stories are *Springhaven, Alice Lorraine* and *The Maid of Sker.* He has also translated the *Georgics* of Vergil. He died Jan. 20, 1900.

**Black Mountains,** a group of mountains in the western part of North Carolina, a few miles west of the Blue Ridge and belonging to the Appalachian system. The name comes from the forests of dark balsams on its summits. It has twelve peaks, all higher than Mt. Washington, the highest being the Black Dome or Mitchell's Peak, as it is called in honor of Dr. Mitchell, of the University of North Carolina, who perished while exploring the mountain and was buried on its top. The height of this peak is 6,707 feet—the highest point of the United States east of the Rocky Mountains.

**Black Sea** or **Euxine,** meaning "hospitable," is an inland sea lying between Europe and Asia. Its greatest length is 720 miles, its greatest breadth 380 miles, and it covers 163,711 square miles or, including the Sea of Azov, 172,500 miles. It is thus more than five times as large as Lake Superior. Its depth in the center is over a thousand fathoms. It is connected with the Sea of Azov on the northeast, and flows into the Bosphorus, the Sea of Marmora and the Dardanelles. Many large rivers flow into it, and it drains nearly one-quarter of the surface of Europe, besides a large area of Asia. There is only one island in it, the Adassi or Isle of Serpents, opposite the mouths of the Danube. There are many important ports along the coast, such as Kustendji, Odessa, Trebizond and Sebastopol. In summer navigation is safe and easy, but in winter, when the sea is closed on every side, conflicting winds rage over it, and short but terrible storms are frequent. There is no tide, but the large rivers flowing into it give rise to currents. The sea has been known and navigated from a very early period. For many years it was under the control of Turkey alone, but now both Russia and Turkey maintain fleets in its waters, and it is open to the commerce of all nations.

**Black Snake,** in many localities called blue racer, is common in nearly all parts of the United States. Its length varies from four to six or seven feet, and it moves very rapidly. It feeds on frogs, lizards, mice and eggs, occasionally captures a young chicken, and drinks cream and milk in dairies. It has no poison fangs, but the embrace of its coils is powerful. The name is also applied to poisonous black or blackish serpents of the eastern hemisphere.

**Blackstone, Sir William,** an English commentator on law, was born in London in 1723, and after his college and law studies he began the practice of law. He was not at first successful, but, after delivering a course

of lectures at Oxford on the law of England, was made professor of English law there Later he was made a king's counsel, entered parliament, was appointed solicitor-general to the queen, was knighted, and finally appointed a justice of the court of common pleas. He published in four volumes his Oxford lectures, which form his celebrated *Commentaries on the Law of England.* He died in 1780.

**Black'well, Elizabeth,** the first woman who received a medical diploma in the United States, was born in England in 1821, and with her family emigrated in 1832 to the United States. She taught for some years at Cincinnati, helping to support a large family of brothers and sisters. After much difficulty she was admitted to the Medical School at Geneva, N. Y., from which she graduated with honors in 1849. She next visited Europe in furtherance of her studies, and was admitted into hospitals in Paris and in London. In 1851 she returned to the United States and began a successful practice in New York, where she has mostly resided. In 1859, with her sister, she opened the New York Infirmary for Women and Children. In 1869 she delivered a course of medical lectures in England. She has written several popular books on the laws of health, especially for girls, besides a volume entitled *Pioneer Work in Opening the Medical Profession to Women* (1905.) On all questions of social reform and the status of woman she has always taken an active part.

**Black' well's Island** is in the East River and is part of New York city. It has an area of 120 acres. It is the seat of many of the penal institutions of the city. It has a lunatic asylum, an asylum for the blind, a workhouse, almshouse, penitentiary and several hospitals. On its north end is a stone lighthouse, with a fixed red light, which is fifty-four feet above the sea

**Blaine** (*blān*), **James Gillespie,** an American statesman, was born at West Brownsville, Pa., Jan. 31, 1830. He graduated at Washington College in 1847, and then taught for two years in the Western Military Institution, Georgetown, Ky. After studying law and being admitted to the bar, he removed to Augusta, Me., where he took charge of the *Kennebec Journal.* When the Republican party was formed, he became speaker; was chairman of the state committee of that party; and served four years in the state legislature, being speaker of the house for two years. He edited the Portland *Advertiser*, and in 1862 entered Congress, where he soon showed himself an able and ready debater, and, on the death of Thaddeus Stevens, became leader of his party in the house. From 1869 to 1875 he was speaker, and in the latter year was chosen senator from Maine. During the short administration of President Garfield, Blaine was secretary of state, and, on the death of his chief, he retired to his home in Augusta, having first delivered an eulogy on Garfield before the two houses of Congress. He now began to prepare his *Twenty Years of Congress*, a review of American political history during 1861–81, and had issued the first volume when he was nominated for the presidency in 1884, but was defeated by Mr. Cleveland. The next few years were spent in literary work and in visiting Europe, and when Mr. Harrison became president, in March, 1889, Blaine again became secretary of state. Here he carried out the scheme of a Pan-American congress, which he had begun in his former short term, and was chosen chairman of the meeting. The policy of reciprocity with other American states, at his suggestion, became a feature of the McKinley tariff law. In June, 1892, Blaine resigned from the cabinet. He died at Washington, D. C., Jan. 28, 1893.

JAMES G. BLAINE

**Blair, Hon. Andrew George,** born in Fredericton, New Brunswick, in 1844. Called to the Bar in 1866. Entered New Brunswick Legislature in 1878. Leader of the Opposition in 1879. Remained in the Legislature until 1896. In 1883 defeated the Hannington Government and formed a new Government. His Government was sustained at four general elections. Member of the Inter-Provincial Conference held at Quebec, 1887. Elected to the House of Commons and joined the Laurier Administration in 1896 as Minister of Railways and Canals. Secured the extension of the Intercolonial Railway from Levis to Montreal in 1898. While he was Minister the St. Lawrence canals were deepened to 14 feet from the Great Lakes to the sea.

**Blair, Francis Preston,** journalist and politician, and founder and editor for a time of the *Washington Globe*, was born in Virginia in 1791, and died in Maryland, Oct. 18, 1876. He took an active part in politics before and after the War of the Rebellion, and on both the Democratic and the Republican side. In 1856 he was instrumental in organizing the republican party and in 1860 was one of the leaders who nominated Lincoln for the presidency. During the war he sought to bring about peace in the South. After Lincoln's death he was, however, opposed to the Republican reconstruction policy, and returned to the Democratic camp.

**Blair, Francis Preston, Jr.,** American politician, major-general of volunteers and son of the foregoing, was born at Lexington, Ky., Feb. 19, 1821, and died at St. Louis, July 9, 1875. A graduate of Princeton and student of law, he became a member of the Kentucky bar and practiced for a time at St. Louis. In 1845 the state of his health took him westward to the Rockies, and there he took part in the war with Mexico. Later on, he became editor of the *Missouri Democrat*, and represented his state in the legislature. He was elected to Congress as a republican in 1856, and was re-elected in 1862. When the Civil War broke out, he became colonel and later major-general of volunteers, commanded a division in the Vicksburg campaign, and was at the head of the 17th corps in Sherman's march to the sea. Like his father, he veered to both political parties in the state, and in 1868 was democratic candidate for vice-president. From 1870 to 1873 he was United States senator from Missouri. In 1848 he published a *Life of General W O. Butler.*

**Blair, Montgomery,** an American officer and politician, was born in Franklin County, Ky., in 1813. After graduating at West Point, he served in the Seminole War, and then entered upon the practice of law, rising high in the profession and filling several important positions. In 1857 he was counsel for Dred Scott. Under President Lincoln Blair was postmaster-general for four years. He then returned to the practice of his profession, and died July 27, 1883, at Silver Spring, Md.

**Blake, Edward,** was born in Middlesex County, Ontario, in 1833, and in 1858 graduated at the University of Toronto, of which he was elected chancellor in 1876. Elected to the Ontario legislature in 1867, he led the Opposition till 1871, when he was called on to form a government. He resigned the Ontario premiership in 1872 after a brilliant and successful career in its local legislature. In 1867 he had been elected to the Canadian House of Commons.

HON. EDWARD BLAKE

At the request of the leaders of the Irish Parliamentary party, he went to Ireland in 1892 and was elected Member for South Longford. In 1904 elected a member of the Executive Committee of the Irish Party. A member of the Royal commission to inquire into the financial relations between Great Britain and Ireland. In 1896 one of the committee of 15 of the House of Commons to investigate South African affairs and the causes of the Transvaal raid. His cross-examination of Cecil Rhodes was the leading feature of the investigation. Elected Chancellor of the University of Toronto in 1876, contributed generously to its funds. Engaged frequently in very important cases before the Privy Council. One of the greatest advocates of the day of any country.

**Blake, Robert,** the greatest English admiral next to Nelson, was born at Bridgewater in 1598. Until he was forty years old he lived quietly in England as a country gentleman. Entering the army on the side of Cromwell, he distinguished himself by defending Taunton against the Royalists for a year, and in 1649 he was appointed with two others to command the fleet. Within two years his energy had built up the fleet, blockaded Lisbon, destroyed the squadron of Prince Rupert, and forced the royalists to give up their last strongholds. At this time the Dutch were masters of the sea, and in 1652 Blake began his struggle with them. After several battles with the great Dutch admirals, in February, 1653. Blake defeated Van Tromp in a long running fight which extended from Portland to Calais, and within a few months, instead of Van Tromp's scouring the channel with a broom at his masthead, the English had established their naval supremacy. In 1654 he made the fleet of England respected in the Mediterranean. The last exploit of the great admiral, however, was his greatest and most daring one. In 1657, hearing that a Spanish fleet had arrived at Santa Cruz, he at once sailed thither, where he found sixteen ships lying in the semicircular bay, protected by a castle and six or seven forts. Dashing boldly in by night, he completely destroyed the ships and the town, and withdrew with little loss. This exploit excited great enthusiasm in England and admiration throughout Europe. After this his health failed rapidly and he died on his way home, as he was sailing into the harbor of Plymouth, Aug. 17, 1657.

ADMIRAL BLAKE

**Blake, William,** an English artist and poet, was born in London, in 1757. As a boy he was dreamy and spent his time in drawing and verse making. After studying art for some years, he began to paint in water colors, and to engrave illustrations for

magazines. At the same time he wrote poetry which showed great power and beauty. *Poetical Sketches, Songs of Experience* and *Songs of Innocence* are among his best works. Most of his other poems are strange and mysterious, and are valuable chiefly because of the wonderful way he had of illustrating and printing them in various colors, which he said had been revealed to him. Among these quaint and now rare editions are *Book of Prophecies, Gates of Paradise, Vision of the Daughters of Albion* and *America*. During his life, Blake's genius was little recognized, but many now believe that England has not produced his superior in force and originality. He died in London, Aug. 12, 1827.

**Blanc** (*blän*), **Jean Joseph Louis,** a noted French socialist and historian, was born at Madrid in 1811. He studied at Paris and wrote for several newspapers, and in 1839 founded the *Review of Progress*, in which he brought out his chief work on socialism, the *Organization of Labor*. This work, which proposed to establish social workshops connected with the government, and with an equal profit to the laborers, was at once widely popular among the French workmen. His next work, *The History of Ten Years*, was aimed at the royal government. It was followed by his *History of the French Revolution*. In the revolution of 1848 Blanc took some part, but was soon after accused, without reason, of participating in the civil disturbances which took place in Paris, and he escaped to England. Here he remained many years, engaged in writing, and on the fall of the empire, in 1871, he returned to France. He was elected to the national assembly, and later became a member of the chamber of deputies. He died at Cannes, Dec. 6, 1882

**Blanc, Mont.** See ALPS.

**Blarney Stone,** a famous stone in the ruins of old Blarney castle, near Cork, which is said to give to one who kisses it the power of saying agreeable things. From this story comes the word *Blarney*, a term for complimentary or flattering talk.

**Blast Furnace,** a furnace in which the burning of fuel is increased greatly by a blast blown from a bellows or by means of fans or other blowing-engines. Blast furnaces are used mainly for smelting iron, copper and lead ores. See METALLURGY.

**Blasting,** the method of loosening or breaking in pieces masses of rock by means of the explosion of gunpowder or dynamite. It is used in sinking shafts, cutting tunnels, building roads and railroads and clearing channels. Formerly a form of slow burning gunpowder was used, but in 1868 nitroglycerine was used for the first time in boring the Hoosac tunnel. Now similar high explosives are universally used for blasting. Nitroglycerine is an explosive chemical compound made by treating glycerine with nitric and sulphuric acids. It is often mixed with an absorbent material, as sawdust, and dynamite is a general term for high explosives of this kind. The explosive is placed in holes which are drilled in the rock by hand or power drills, and exploded either by slow burning fuses or more generally by an electric spark. The removal of Flood Rock at Hell Gate in the East River, New York, October, 1885, was done by this method, and was the largest blast ever made. The rock covered about nine acres, 21,669 feet of tunnel were made, over 40,000 pounds of high explosives were used, and 80,232 cubic yards of rock excavated.

**Blavatsky** (*blä-vät'ski*), **Madame Helena Petrovna,** a Russian theosophist and founder of the Theosophical Society, was born in Russia in 1831. She was of noble descent and married a Russian councillor of state, from whom, however, she separated early in her married life. Fond of travel, she found her way to Tibet, where she claims she received the theosophical doctrines connected with her name. From 1873 to 1879 she was a resident of New York, when she founded the Theosophical Society and published *Isis Unveiled*. Her other writings include *The Key to Theosophy, The Secret Doctrine, The Voice of Silence*, etc. She died in London, May 8, 1891.

**Bleaching** (from the Anglo-Saxon *blaec*, pale), the process of whitening textile fabrics (cotton, linen and silk, also wool) by removing coloring matters and substances naturally present, or adhering to them in the course of their manufacture. In early days it used to be the custom to send Scotch linens to be bleached in Holland, and the latter name is still used for a kind of unbleached linen. The term *lawn*, which continues in use, received its name from being spread on lawns or cultivated grass fields for bleaching purposes. Besides linen and cotton, wool, silk, jute, paper and now even wood are submitted to the bleaching process. The term bleaching is moreover applied to the decolorizing of castor-oil, bees-wax and other fatty materials by exposure to sunlight. Scouring and bleaching are now largely effected by the use of chemicals and volatile liquids, soda ash, resin soaps and more or less caustic alkalis being utilized in place of baths of lime, lye and sulphuric acid. For the bleaching of silk, after scouring, sulphur dioxide is used, or, better still, hydrogen peroxide. As a bleaching agent, chloride of lime or bleaching powder is resorted to for the removal of metallic and other colors in calico-printing.

**Bleak House,** a novel written by Charles Dickens during 1852-3. This novel

was in part a satire on the long delays of the Court of Chancery; but the story itself is a great favorite. It has been said that the dreary residence from which the name of the book is taken was suggested to the author by a residence at Broadstairs, Kent, where Dickens lived in summer.

**Blenheim** (*blĕn'ĭm*), a village of Bavaria, 23 miles northwest of Augsburg, famous as the scene of the Duke of Marlborough's great victory over the French and Bavarians, Aug. 13, 1704. The two armies numbered about 50,000 on either side. The French and Bavarians lay in a strong position, and the attack was made by the English and Austrians, with their allies, headed by the Duke of Marlborough, the great English general, and Prince Eugene. The onset was long resisted, until Marlborough, by two desperate charges, which he led in person, broke the enemy's line and decided the day. Of the defeated army only 20,000 escaped. Twelve thousand were killed and 14,000 captured. The battle is also called the battle of Höchstadt, from the name of another small village near by. Near Blenheim, also, the French defeated the Austrians in 1800.

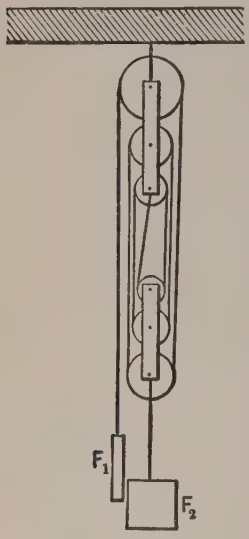
**Blennerhas'sett, Harman,** known in connection with Aaron Burr's conspiracy, was born in England about 1764. He was of an Irish family, but, becoming dissatisfied with Ireland, sold his Irish estates for a sum exceeding $100,000 and came to America. He bought an island of 170 acres in the Ohio River near Parkersburg, W. Va., and built on it a fine mansion and adorned his home with all the comforts and refinements which culture could suggest and wealth supply. Many visitors enjoyed his hospitality, and among them Aaron Burr, still bitter because of his political defeat. He filled Blennerhassett's mind with plans of forming an empire in Mexico, for which he made extensive preparations. When Burr was arrested and brought to trial, Blennerhassett was arrested, but on the acquittal of Burr, he was released. His fine property was sold to creditors, and his later life was clouded and unhappy. He died on the Island of Guernsey in 1831.

**Blight,** a diseased condition of plants, causing deadening of the stems or roots, yellowing and early falling of the leaves, or shriveling and premature decay of the fruit. In a restricted sense the word refers to a certain mildew affection of the leaves. Blight exists among plants in their wild state, and is often aggravated by cultivation. Though pre-eminently a fungous disease (see FUNGI), it may appear, as often shown by the foliage turning yellow, from the roots being poorly supplied with food and air. From the standpoint of the producer, blights may be roughly classed as the rusts and smuts of grains, blights of orchard and shade trees, of small fruits and grapes and of garden products; though several or all of these sorts of plants may be attacked by fungi that are similar, botanically, or are the same thing. Often a single species of blight-producing fungus will pass through several stages of development on entirely different plants; as in the case of wheat rust. (See ÆCIDIOMYCETES.) Damage to cereals from rust and smut in the United States amounts to from $25,000,000 to $30,000,000 yearly. While rust is common, it causes damage only when cool, damp weather allows it to mature more rapidly than the grain. While the black spores (q. v.) of rust live over the winter, in the case of those orchard blights affecting the wood, only those spores survive where the dead and healthy tissues meet. Here form, in the spring, the familiar sweet masses of "gum," which attract insects and so scatter their spores. All branches showing such hold-over blight should be pruned out. Certain apple rusts pass one stage in the jelly-like masses, commonly noticed on cedar trees after spring rains, and popularly known as cedar-apples. Some typical fungous diseases are the blights, mildews, scab and rot of potatoes beet-root rot, peach-leaf curl, apple scab, rye ergot, corn smut, loose and stinking smut of wheat, wilt disease of flax and of cow-peas. Often the ground becomes infected, as in several of the above, and must be abandoned as regards the susceptible crop. Potato scab and smuts that are transmitted by the seed are prevented by treating the seed with a weak solution of 4 per cent. formaldehyde (one pint to 45 gallons of water). Blight on trees and small fruits, as well as insect pests, is fought by spraying (see SPRAYING MIXTURES), which kills the parasite without injuring the host. The Department of Agriculture investigated a leaf-blight that ruins nursery seedlings (see GRAFTING), and showed by experiment on 100,000 young trees that treatment costing but 90 cents per 1,000 trees netted profits averaging $13 per 1,000, and going as high as $40. Other experiments showed that at an expense of 15 cents per fruit-bearing tree, the marketable product could be increased 25 to 50 per cent. Black rot affecting grapes was first studied by the Department, which discovered a treatment increasing the yield 20 to 80 per cent. In five years its methods were used by 50,000 grape-growers. Plant breeding (q. v.) is used to increase the power of resisting not only insects and fungi but blight induced by climatic conditions and inherent weakness which, in the case of the California raisin grape, sometimes results in a loss of a million dollars in a single

year. References: Bulletins of the Department of Agriculture and of the State Experiment Stations.

**Blind Fishes.** The caves of the United States are inhabited by six species of fish with imperfect eyes. Five of them have rudimentary eyes, and in one the eyes are very degenerate. They belong to the family *Amblyopsidae*. They are small fishes related to minnows. Their senses of hearing and touch are highly developed and enable them to capture prey. The formation of these blind animals is an interesting problem. They respond negatively to the stimulation of light, and doubtless they sought the caves voluntarily instead of being carried in by accident. There are also blind fishes in the depths of the ocean and in dark places along the shores. See Eigenmann in the *Pop. Science Monthly*, vols. LVI and LVII, 1900.

**Block and Tackle,** a combination of fixed and movable pulleys, employed to secure what engineers call a large "mechanical advantage." There are various forms, of which that represented in the figure will serve as a type. Here one rope passes over each of the pulleys. And since each movable pulley gives a mechanical advantage of two, it is evident that with the block and tackle shown in the figure one is able to exert a force nearly six times as great as without its aid. If no energy were used up inside the mechanism, one could lift exactly six times as much with as without the tackle. It should be carefully observed that one secures no gain in energy by this device. The energy stored up in a lifted mass is always a little less than the energy required to lift it, whether a block and tackle be used or not.



BLOCK AND TACKLE

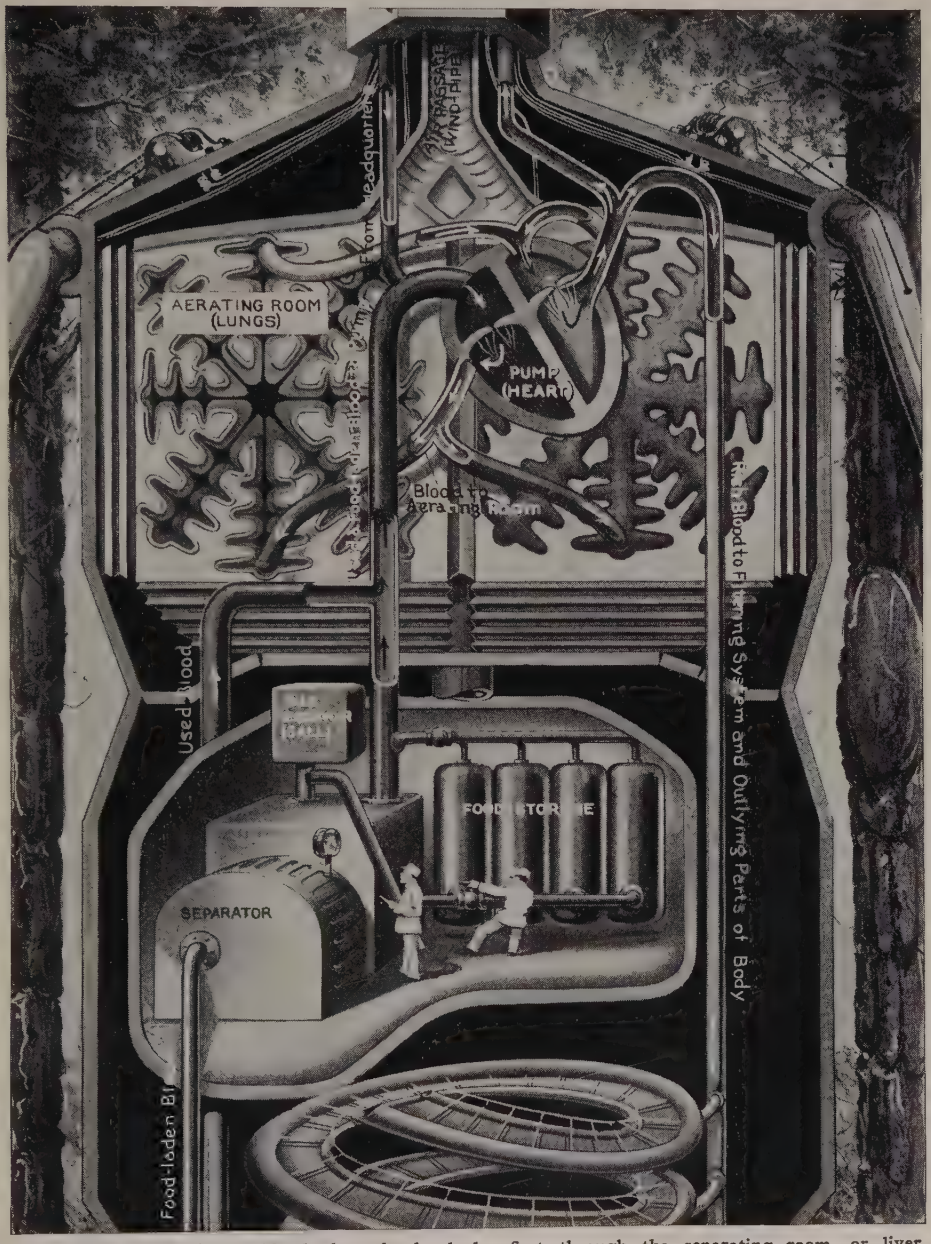
**Block System,** a system of signals at intervals along a line of railroad, intended to decrease the danger of accident. The system of telegraphing the arrival of a train from station to station, used in England as early as 1839, may be quoted as its origin. It was first introduced into the U. S. in 1876 by the Pennsylvania railroad. In general the block system divides a line into sections, upon each of which only one train is admitted at a time. The system of giving staffs, a staff being given to a train by a station-master only when one has been returned by the train previously upon that section, is a variety of block system which is adapted only to single lines. The serious accidents which occur upon American railroads have led to an agitation for the compulsory use of the block system, which is universal in England but not in America. To keep the sections clear for any one train it adds the additional safeguard of an interval of space to the universal practice of an interval of time between trains. The expense of the block system is sometimes lessened by automatic devices for block signals which minimize the direct manipulation of levers by signalmen.

**Blockade,** in naval warfare is the shutting up of a port of a country, cutting off communication with the outside world. It is effected by stationing sufficient numbers of ships off the ports to make entrance impracticable. Neutral powers, because the interference with their commerce injures them, must be fully notified of the blockade by the state that attempts it Then endeavors to deal with the ports blockaded become contrary to the law of nations, and attempts to trade with such ports render ships and cargoes liable to confiscation. But if blockades are to be binding on neutrals, they must not merely be blockades on paper or blockades by proclamation. They must also be physically effective. Among famous blockades are that of the European coast from Denmark to Italy in 1807–8, when Napoleon was fighting England; the Crimea in 1854–6 by England, France and Sardinia; the coast of the Confederate States by the Federal Government during 1861–5; Cuba by America in 1898; and Venezuela by Britain, Germany and Italy in 1903.

**Bloemfontein** (*blōōm'fŏn-tĭn'*), capital of the late Orange Free State (now the Orange River Colony), in South Africa. Here, before the outbreak of the Boer War of 1899–1901, was held the conference between President Kruger of the late Transvaal Republic, and the British High Commissioner of South Africa, Sir Alfred (now Lord) Milner. The conference met May 30, but separated June 5, 1899, without having come to any agreement. The State joined the burgher republic of the Transvaal in the war with Britain, and the capital (Bloemfontein) was entered and occupied by the British under Lord Roberts, March 13, 1900. The population is 33,900, of which more than 15,000 are whites and the rest natives.

**Blood,** the circulating fluid of animals. It is a nutrient fluid of varied composition. In the course of its circulation it is continually giving nourishment to the tissues

# AERATING, SEPARATING AND STORAGE SYSTEM




Here we follow the blood through the body, first through the separating room, or liver, which not only acts as a separator, but also stores up food to keep the body going between meals. Into the pipe leading from the separating room is emptied used blood from the lower parts of the body and from headquarters through two additional pipes, and the common stream flows on to the heart pump, which forces it to both sides of the aerating room, where it is spread out and exposed to the fresh air for purification. Then back it goes to the left side of the pump and is sent into the body again for use.

and carrying away from them worn-out material. Therefore, it carries on a sort of exchange with the tissues, in which there are certain sources of loss and certain sources of gain to the blood. For example, it loses to the tissues soluble food material and oxygen; in the lungs it loses carbon dioxid ($CO_2$); through the skin it loses water and certain salts in solution; and through the kidneys it loses the broken-down protoplasm that contains nitrogen and water. But the gain keeps pace with the loss; in the lungs it receives oxygen; from the digestive system it receives soluble food material and water; from the tissues it receives the broken-down material in the form of carbon dioxid, water and nitrogenous waste. From these statements it will be seen that the blood is the agent of exchange between the tissues and the outside world.

There is a similar circulating fluid in insects, mollusks, worms and other simple animals as well as in the vertebrated animals. Contrary to the usual statement, this fluid in the simpler animals, also, contains solid particles or corpuscles, though they correspond with the white blood corpuscles rather than with the red ones. In the fluid part of the blood of the crayfish, also, for example, there is a substance which acts as an oxygen carrier.

As everyone knows, the blood undergoes changes from arterial, bright red color to venous of dark blue tint, and back again from venous to arterial; but we should understand clearly where these changes take place. It is not in the ordinary blood vessels which have thick walls, but in the network of capillaries—those small tubes with very thin walls that connect the arteries and veins. For example, the blood is rendered arterial in the capillaries of the lungs and venous in the capillaries of the tissues; also, all the exchanges spoken of above take place in the capillaries.

Blood is made up of a fluid plasma, in which float minute corpuscles. In higher animals there are two kinds, red and white. The red ones are much more numerous than the white (in the human body about 355 red corpuscles for one white). They are oxygen carriers and their color is due to the presence of the substance (hæmoglobin) which holds the oxygen. They have a regular life-history; they live a few weeks and break down, disappearing principally in the liver and the spleen. It follows, since they disappear, that they must be renewed, and new ones are being continually formed in the red marrow of bones. The white blood corpuscles are larger in size; they possess the power of changing form and creeping. They gather particles of foreign substance, and creep with them out of the blood vessels, and even to the surface of the body. They also feed upon bacteria, and help to rid the body of harmful kinds. The white blood corpuscles are, in a sense, eating cells. They are renewed from the spleen and the lymphatic glands. Physiologists now recognize several kinds of white blood corpuscles.

The clotting of blood prevents profuse bleeding. After a cut the blood tends to form a stringy fibrin in which the corpuscles get entangled and this forms a sort of plug to the smaller vessels and prevents further bleeding. The cut ends of larger blood vessels cannot be stopped in this way.

**Bloodroot,** a wild-flower belonging to the poppy family, of much beauty in the open but quickly perishing when plucked. It is sometimes called Indian Paint, also Red Puccoon. It gets its name from the orange-red juice that fills its thick root-stock. This juice, to be obtained from all parts of the plant and which stains the hands in picking, was highly valued by the Indian and the pioneer mother; the former borrowed it for his war paint, the latter dripped it on sugar and gave it as remedy in cases of colds. The Indians to-day use the juice to dye baskets, quills and moose hair, and use it, too, as a medicine. The white man also appreciates its medicinal properties. Bloodroot is widely distributed from Maine to Florida and west to Nebraska. The blossom grows on a naked stem, and there is a single, large round leaf, which encloses the bud, unfolds and grows with the flower. There are numerous stamens, offering much pollen to visiting insects. At night the blossom closes.

**Bloomfield, N. J.,** a town in Essex County, on the Morris Canal, and on the Erie and the Lackawanna railway 11 miles northwest of Jersey City. Settled towards the close of the 17th century as a part of Newark County, it was separated in 1812 and incorporated a township, receiving its name in honor of Joseph Bloomfield, a revolutionary general officer, who was governor of New Jersey between the years 1803–12. It has a number of attractive suburban residences, together with several important manufacturing establishments, including electric elevators, railroad brake-shoes, paper mills, hat, silk and woolen cloth factories, rubber goods, boots and shoes, pins, organs, etc. It is the seat of the German Theological Seminary of Newark (Presb.), has several notable Presbyterian churches and those of other denominations, together with a Memorial Library, one or four banks and an attractive public park. Population, 17,000.

**Bloomington,** a city of Illinois, county seat of McLean County. It is a handsome city, with wide streets, well shaded, with fine residences and public buildings. It has good railroad facilities, four trunk lines and two interurban electric roads. It has a

large wholesale trade and numerous manufacturing industries. Here is the Illinois Wesleyan University, which has a faculty of 40 and about 1,000 students. The public schools are of high grade, and there is a fine public library. Two miles distant. and connected by electric railway, is Normal, where are located the State Normal University and the State Soldiers' Home. Bloomington was the home of the late Ex-Vice-President Adlai Stevenson. Population, 37,000.

**Bloomington, Ind.,** a city, the county seat of Monroe County, 51 miles southwest of Indianapolis, on the Chicago, Indianapolis & Louisville Railroad. It is the seat of the Indiana State University, with 75 instructors and 1,700 students. The city dates from about the year 1818, and is governed by a mayor and municipal council. Its chief industries embrace furniture, hub and spoke and leather-working factories, woolen mills and tanneries. There are extensive limestone quarries in the neighborhood of the city, which add to its industrial activities. The population is now 11,383.

**Blouet** (*blōō' ā'*), **Paul,** a French author, journalist, and lecturer, who wrote under the *nom de plume* of Max O'Rell, was born in Brittany, March 2, 1848, and educated in Paris. He took part in the Franco-Prussian war and was made prisoner at Sedan (Sept. 3, 1870); he afterward fought against the Commune, was wounded and pensioned. For a time he taught French at St. Paul's School, in London, and wrote his first work, which became instantly popular, *John Bull and His Island.* He subsequently published *John Bull's Daughters; Jacques Bonhomme;* and, after a lecturing visit to this country, he issued *Jonathan and His Continent.* He died May 24, 1903.

**Blowing Machines,** machines for producing artificial currents of compressed air, their uses being well-nigh as manifold as their forms, from the simple, early blacksmith's bellows to the modern rotary jet disk and fan blowers or exhausters of more or less ingenious mechanical types. Among the uses to which they are to-day put are, as contrivances for producing forced draught for boiler furnaces; warm or cool air in school rooms and crowded public buildings; to remove dust and refuse from the same or from factories and work rooms; to supplant vitiated air by pure air; and to furnish, by means of electric fans or the blowing engine, a drying current of air for grain or other substances, likely to spoil by being stored in crowded and heated elevators or warehouses. One of their chief and important uses is for supplying the airblast for Bessemer converters and blast-furnaces, by means of high-pressure steam-cylinders, which are frequently compounded.

For ventilation purposes the disk-blower is largely used and driven by an electric motor or by belting connected with an engine; other contrivances are what is known as the positive blower, such as the Root type, which exerts a higher pressure than the disk or fan blowers; also the steam jet blower, which creates induced currents of air on the principle of the injector, such as are used in locomotives and fire engines for creating a powerful draft.

**Blow'pipe,** a small instrument used for glass blowing and soldering metals, and also in chemistry to determine the nature of substances. By means of it a jet of air is thrown into a flame, causing the flame to burn with great rapidity, and increasing its effect by making it occupy a smaller space. The blow-pipe consists of a funnel-shaped tube of metal, about eight inches long, closed at the wider end and open at the upper end, which forms the mouthpiece. Near the lower end a small tube passes out, through which a fine current of air can be blown. When directed against a candle or gas jet, it makes the heat of the flame very intense, so that hard substances may be quickly melted.

**Blücher** (*blōō'ker*), **Gebhard von,** a distinguished Prussian general, was born at Rostock in 1742. In 1793 he fought against the French on the Rhine, and showed great genius as a cavalry leader. War with the French was renewed in 1806, and Blücher, as lieutenant-general, led the vanguard at the battle of Auestadt, and soon after was captured. He was, however, exchanged, and took a prominent part in the ensuing struggle with Napoleon. Together with the other powers allied against Napoleon, the Prussians, with Blücher as commander-in-chief, defeated the French conqueror at Leipsic in 1813. He was raised to the rank of field-marshal, and the next year led the Prussians against France. He was repeatedly defeated, but finally marched victoriously into Paris, when his king made him Prince of Wahlstadt. After Napoleon s return, in 1815, Blücher again took general command, and, though defeated at Ligny, his timely arrival at the field of Waterloo decided that great victory. He received new honors, and four years later died on his estate of Krieblowitz, in Silesia, September 12, 1819. He was called Marshal Forwards, and is still a great hero among the German people.

**Blueberry,** the term for a small fruit commonly applied in New England to a berry of the *Vaccinium* species. It is sometimes confounded with the bilberry or huckleberry, though it is of a distinct though allied class. See HUCKLEBERRY.

**Bluebird,** also called Blue Robin, an early spring bird of the United States, belonging to the thrush family. Some individuals pass the winter in sheltered places as far north as southern Connecticut. It appears very early in the spring, and in New England begins nesting in April. By the middle of the month about five bluish white eggs are laid. It is a little longer than the English sparrow, has feathers of a rich bright blue above and reddish chestnut on the throat and breast, and white below. The female is duller in color than the male. It is of a happy social disposition, and builds its nest in orchards and near houses, and will take advantage of a box, a deserted woodpecker's nest or a hole in a fence post. A pair raise from two to three broods a summer, at first the young birds being almost black. One of the first birds to come, they are one of the last to leave, remaining until the frosts of November.

"Ah, now that you are gone, I know
The summer's gone!"

The voice is soft and musical, the temper of the bird most amiable. Its beauty and also its usefulness as an insect destroyer make it a very desirable neighbor; one whom it were well to invite close by building for it a tiny house.

**Blue Books** or **Parliamentary Papers** are the official reports, returns and documents printed for the British government, and laid before the houses of Parliament for the use of members. They are uniformly stitched up in dark-blue paper wrappers (in France they are yellow; in Germany and Portugal they are white; in Spain red; and in Italy green); and are called from the color of their covers Blue Books include, besides statistics of the home trade in England, consular reports from abroad; bills presented to and acts passed by parliament; reports of committees of both houses; and all papers and returns moved for by members or granted by government on particular subjects.

**Blue'fish,** a salt-water fish of blue color merging into greenish, widely distributed in temperate seas. Its ordinary size is from two to three feet, weighing four to ten pounds, but larger sizes are taken It is highly prized as a table fish and also as a game fish. It is very destructive, and appears to eat nearly everything that swims Bluefish go in large schools, like a pack of hungry wolves, killing fish not much inferior to themselves in size, and more than is required for their support.

**Blue Jay** (*Cyanocitta Aristata*). Of the jay family, birds that are common in the Old World, the American blue jay will be familiar to most bird lovers. It is smaller than its European kin, but, like its foreign cousin, it has a fine crest and a beautiful purple blue plumage, though its song is harsher, and it is a great depredator, and sometimes devours the eggs and young of other birds, especially after the breeding season. It is also a fighter, though its courage is not of a high order attacking owls and squirrels at times; while its food consists of anything it can obtain in winter, and in summer feeding on insects, nuts, seeds and fruits It is found along the coast of North America from Newfoundland and the Canadian maritime provinces south to Florida and the Gulf, and inland as far as the plains. The long-tailed blue jay is an inhabitant of Central and South America.

BLUE JAY

**Blue Laws,** a name sometimes given to the early laws of the New England states, especially of the New Haven colony. The appellation probably came from the strictness and severity of the early rules of the Puritans. No such distinct system of laws as the blue laws, however, existed in New Haven.

**Blue Ridge,** the range of the Alleghenies which lies nearest to the Atlantic Ocean, and extends in a northeast and southwest direction through Pennsylvania, Maryland, Virginia, North Carolina and Georgia. The spur in Pennsylvania is called South Mountain. From the James River to the line of North Carolina the ridge is called the Allegheny Mountain.

**Blue Warbler.** See BLUE BIRD.

**Boa,** a name loosely applied to large serpents that crush their prey in coils of their bodies. The name properly belongs to the boa constrictor and the anaconda, both natives of tropical South America. The former lives in dry bushy regions and the latter in damp places; it is often called the water boa. The boa constrictor attains a length of twelve feet and upward, but the anaconda is much larger. It is difficult to get trustworthy measurements, but it is doubtful that it exceeds twenty feet in length. They are both to be distinguished from the pythons, which are residents of the tropical regions of the old world. The boas have no poison fangs, but their powers of crushing are great. They are able to swallow whole animals the size of a small dog, or, perhaps, even a goat. After feeding in this way, they remain torpid for several weeks to complete

the process of digestion, and during this period they may be easily killed. See SNAKES.

**Boadicea** (*bŏ'ā-dĭ-sē'ā*), "the British warrior queen," was wife of the king of the Iceni, a tribe existing in the time of the Romans, living in the region now occupied by the English counties of Norfolk and Suffolk. At her husband's death, about 60 A. D., the Romans seized her land and treated her and her people cruelly. Boadicea, enraged, gathered a large army, captured several Roman colonies and destroyed as many as 70,000 Romans. She was in turn defeated with loss, and in despair killed herself by poison. The poets Cowper and Tennyson have told her story in verse.

**Boar,** the male of swine or, when applied to the wild stock of swine, used for either sex. Its native country is the Old World, where the wild stock abounds in parts of Europe, in Asia and in Africa. The domestic breeds of swine are all probably descendants of the wild stock. The wild boar is a large, powerful beast, measuring about four feet in length. Its color is dark brown. It comes from its place of concealment at night, feeding on roots, herbs, grubs etc. Boar-hunting has long been considered one of the most exciting sports of the chase It was once a favorite sport in England, and is still practiced in parts of Europe, India and Syria. In some places toils and nets are used; in others dogs, which bring the boar to bay, when he is killed with a spear or a knife. When at bay he is very dangerous, and will display remarkable courage and tenacity. The bristles are in demand for brushes.

**Board of Health.** This name is given to the body which is created by the government of a city, or state or nation for the purpose of protecting the health of the people. A national board of health was set up by the U. S. government in 1879; but after four years it was discontinued, and its duties divided among other offices. But most of the states support their own boards of health A board was established as early as 1869 in Massachusetts, and the example was quickly followed. Large cities have city boards of health. Boards of health regulate the sale and preparation of foods and medicines; and they control the erection of buildings and all that concerns cleanliness and sanitation. They enforce needful precautions against infectious diseases and epidemics.

**Board of Trade,** an organization whose members more advantageously transact business together than separately. Generally it is an exchange where cotton, grain, produce or provisions are dealt in. It originated at Marseilles about 1600. The Chicago Board, founded in 1848, is the greatest grain market in the world. It has established a uniform system of inspection and grading. It expressly provides for actual delivery of everything bought and sold, even when transferred by margin deals. Business is transacted by making contracts. These require delivery at a specified date, and are known as futures. Part-payments, called margins, are made on the day of the deal, and consist of money or securities deposited with the broker to cover probable fluctuations in price, the broker providing the balance. Suppose a member buys 5,000 bushels of wheat. He deposits $250 as margin to cover five cents' possible decline in the price *per* bushel. Should the price advance the trader can sell, take the profit and withdraw his deposit. If the price decline, the trader deposits enough more to cover the decline, or sells, losing as much of his margin as the amount of the decline, the broker's commissions and the interest on the money the broker advanced. Trading on margins is the leading feature of boards of trade. Almost every exchange has a clearing-house or establishment where differences of accounts are adjusted. At the close of business, daily, all dealings are reported. Members who have lost money send certified checks for the amount, those who have made it receive payment. Though business on the floor is transacted with noise and seeming confusion, and is vast in volume, it is carried on with speed and ease. One of the means that bring these results about is the trader's use of a sign-language.

**Board'man, George Dana,** a Baptist American missionary, was born at Livermore, Maine, in 1810. In 1825 he went to Burma, and there threw himself into mission work, especially among the Karens, becoming practically founder of the Karen mission. Worn out by his labors, he died at the early age of 30 (Feb. 11, 1831), having accomplished what few men attain in a long life. He left seventy members of his mission church, and within a few years, by means of the seed he had sown, thousands of the Karens were converted.

**Bobolink,** a beautiful American bird. Passing the winter in S. America, it comes northward in the early spring, and breeds from New Jersey north to Nova Scotia and westward to Utah. Its length is about seven or eight inches, and its color varies with the season In the early summer the male is black, buff and white, while the female is sparrow-like in plumage. This bright coat the male changes in July and August for one like that of its mate, and journeying south, they are shot for the table under the name of reed-birds. The birds cease singing at the close of the nesting season In late autumn they appear in the cultivated fields of rice in South

Carolina and Georgia. They are here known as rice-birds, and do great damage to the rice crops.

From here they go to their distant winter quarters in the West Indies and South America. The Bobolink is known by many names, being called May bird, Meadow-bird, American Ortolan, Butter-bird and Skunk Black-bird. Unlike most birds, his black color is on the breast, above he is light, scarcely to be distinguished from the meadow-grass in which he makes his home. The nest upon the ground is built largely of this grass, with sometimes a few leaves. The eggs, three to seven in number, vary in size and color. Insects are their chief food. The Bobolink is a shy bird; seldom seen, but often heard, the song of the male is musical, rippling and jolly. John Burroughs calls him "the gladdest bird that sings and flies." . . .

BOBOLINK

"Bubbling throat and hovering flight
And jubilant heart as e'er was made."

**Bob White,** a very interesting and useful bird, distributed throughout the United States from Maine to Dakota and south to the Gulf. He is usually called quail, but belongs to a different family from the quail of the old world. He is a true friend to the farmer, making way with seeds of weeds and with destructive insects, eats the potato beetle and the moth responsible for the dreaded cut-worm. The male is 10 inches in length; above, wood-brown barred with black, near the tail mottled gray; front of head black; throat white; under part, whitish marked with black; above the eye on each side of the head a long line of white. His call is most characteristic, the loud, clear whistle a distinct "Bob White," "Bob White." It nests on the ground; in open fields, by roadside wall, and in scrubby places, the loose nest made of grass, leaves, weeds and straw. The numerous and conspicuous eggs are white, and as a rule vary in number from 10 to 18, though 25 have been known. Two or three broods are raised by one pair. The mating season begins early in May, but eggs are found from late May till late summer. "There are few prettier sights than a family of old quail with their young walking about fearlessly in a woodland meadow. The bird's domestic life is particularly interesting from the part the male plays in the family, helping to build the nest, feeding his mate on the eggs, and, in case of her death, brooding in her place." (Dugmore).

There is also a Florida Bob White, smaller and darker than the one to the north. As is well known, Bob White is a valued game bird, in the north called quail, in the south, partridge. See Dugmore: *Bird Homes;* Merriam: *Birds of Village and Field.*

**Boccaccio** (*bŏk-kā'chŏ*), **Giovanni,** an Italian novelist, was born either at Paris or at Florence in 1313. The early part of his life was spent at Naples, where he fell in love with a princess, whom, under the name of Fiammetta, he has made famous in his poems and stories. His most noted work is *The Decameron.* It opens with a description of the plague at Florence in 1348. A party of ladies and gentlemen who have left the city for rest, while away ten days (whence the name Decameron) in telling stories in a garden attached to a country villa. In all, a hundred tales are told. Boccaccio took the popular stories of the day and told them in a beautiful and classic Italian, which has placed him among the great romancers of Europe. Many later writers have drawn their plots from his stories. Later in life, Boccaccio gave up the gay life of society and devoted himself to business and study. He became acquainted with Petrarch, the great Italian poet, and they were for long close friends. Boccaccio died at Certaldo, Italy, in 1375.

**Bodleian** (*bŏd-lē'ăn*) **Library,** the public library of Oxford University, England, named after Sir Thomas Bodley, who gave to it many books and did much to build it up in the early part of the 17th century. Many other valuable collections have been added to it, and at present it is entitled to a copy of every book published in Great Britain. The library is especially rich in works connected with biblical literature and in materials for British history. It contains about 600,000 volumes and about 30,000 manuscripts.

**Bœotia** (*bē-ō'shĭ-ȧ*), one of the ancient divisions of Greece, lying between Attica and Megara on the south and Locris and Phocis on the north. Its area was about 1,120 square miles, a little smaller than Rhode Island. It was largely inclosed by mountains, and when its main river, the Cephissus, poured its swollen floods into Lake Copias in the spring, the plain for miles around became a lake. In the days of Alexander the Great a vast tunnel was cut in the rock for the discharge of the water, but this fell into ruin and the district remained marshy and unhealthful until it was drained in 1886. The fourteen greater cities of Bœotia formed the Bœotian League with Thebes at its head, and many famous battles were fought here. The people of this district fell behind the rest of the Greeks in culture, so that Bœotia became a general name for dullness; but the district, nevertheless, gave birth to the

great general Epaminondas, to the poets Hesiod and Pindar, and to the historian Plutarch. Bœotia and Attica together now form a province in the kingdom of Greece, with an area of 2,472 square miles and a population of 407,063. See PLATÆA and THEBES.

**Boerhaave** (*bōr'hāv* or *bōōr'hä-ve*), **Hermann,** the most famous physician of the 18th century, was born near Leyden in 1668. After a long and thorough course of study, he was appointed lecturer on the theory of medicine at the University of Leyden. He devoted himself to chemistry, mathematics and botany, and besides his work in his own line he was for a time engrossed by these studies. He published several works on medicine and a work on chemistry. He became known throughout Europe, and patients and students flocked to him from all countries. Peter the Great visited him and received instruction from him, and the story is told that a Chinese mandarin sent him a letter addressed "Boerhaave, celebrated physician, Europe." He was a brilliant lecturer, and his personal character was admirable. After his death, in 1738, the city of Leyden raised a monument to his memory in the church of St. Peter, inscribed "To the Health-giving Skill of Boerhaave."

**Boers** (*bōōrz*), meaning "farmers," is the name given to the Dutch colonists of South Africa, who are engaged in agriculture and cattle-raising. As early as the 17th century their first settlement was made at the Cape of Good Hope (1652), and they still have the old Dutch characteristics, especially the love of freedom, with an added energy and recklessness, although they have mixed to some extent with other races. The Cape was ceded to England in 1814, and in 1835 the Boers, not liking the new government, as it prohibited the holding of slaves, went northward in bands and occupied Natal, the Orange Free State and the Transvaal. They seized the land of the natives, whom they reduced to a sort of servitude. They are an interesting people, sober, industrious, good horsemen and splendid marksmen. See NATAL, ORANGE RIVER COLONY and TRANSVAAL.

**Boer War** (1899–1901). Dutch disaffection toward England's domination in South Africa long existed, and in the country there was always an atmosphere of hostility and, at periods, of actual strife. Manifestations of racial resentment date back as far as the era of the closing rule of the Dutch East India Company, at the end of the 18th century and the occupation of the Cape by the British. Still more incensed became the Dutch population when England abolished slavery and sought to discipline the Boers, owing to their harsh treatment and enslavement of the Basutos and Griquas. This attitude of the dominant power led to the great "trek" in the thirties, when the stout Dutch burghers put the Orange River and, subsequently the Vaal, between them and the rule of Britain. Nor were racial antipathies in any way softened when, in consequence of the chronic native wars, England intervened in the affairs of the Transvaal and annexed their territory in 1877, though four years later (1881) she restored it to self-government, subject, however, to the suzerainty of the British crown. The convention of 1884 somewhat modified the terms of this restoration, the control which Britain desired to exercise leaving the South African Republic (which the Transvaal government was now officially named), free to form an alliance with their Dutch kin in the Orange Free State, but insisting upon the right to control the external affairs of the republic, if occasion arose to do so. England's object in insisting on this control over the external affairs of the Transvaal was influenced partly by her concern for the peace of the whole of South Africa, where she had many colonies; and partly by the determination to check the paramountcy of the Afrikander influence in the country. Nor was England uninfluenced by the fact that the British people, especially of the aggressive Tory type, bitterly resented the Gladstonian surrender of British interests in 1881, and were humiliated by the defeat of Sir George Colley by the Boers at Majuba Hill. The incoming of a foreign element, chiefly of British nationality, in 1884, after gold was discovered in the Transvaal, added to the racial friction, and incited the Boers to treat them unjustly as citizens. This treatment of the newcomers, who were refused the rights of representation and indeed of liberty and free speech, led to the abortive attempt of some of the restless spirits of the British community to overthrow the Dutch government. This was the Jameson raid, which had its ignominious ending in the surrender at Doornkop on Jan. 2, 1895. The rising resulted only in increasing the oppression of the Outlanders, who now turned to the mother country for redress of their grievances, and forwarded to the crown a petition praying for rights which they claimed were in accordance with the conventions and treaties. This action brought about a conference held at Bloemfontein in May, 1899, between the British High Commissioner (Sir Alfred [now Lord] Milner) and President Kruger, which resulted adversely to Britain's demand of the franchise for her subjects. The following months were spent in diplomatic overtures, which were abruptly ended in the month of October (1899), when the Transvaal, with its ally, the Orange Free State, in an ultimatum, addressed to the British government, demanded the withdrawal of the British forces from the Boer frontier and the recall of the reinforcements then on the

way to Cape Colony. On England replying that the demand was such as "her majesty's government deemed it impossible to discuss," the Boers crossed the frontier in force (Oct. 11–13), and precipitated the war. The Boers are said to have had 75,000 men in the field.

The earliest actions, on the part of the Boers, were to lay siege to Mafeking, defended by Colonel Baden-Powell, and to shut up a small British force, commanded by Colonel Kekewich, in Kimberley, the famous seat of the diamond mines. Both of these towns lie on the western frontier of the Orange Free State and the Transvaal. At the same time Natal was invaded, and battles were fought at Elandslaagte, Nicholson's Nek and Farquhar's Farm. These resulted for the most part in favor of the Boers At the beginning of November the siege of Ladysmith began, where some 10,000 British, under Sir George White, were for months held by about 20,000 Boers. Meanwhile the English army corps, under General Sir Redvers Buller, arrived in Natal, and advanced as far as the Tugela River, while other columns were formed in Cape Colony, designed to operate in the Orange Free State and to retake Colesburg and Stormberg, south of the Orange River, which had been taken possession of by the Boers. To recapture these towns, Generals French and Gatacre were assigned. Lord Methuen, who pressed forward to the relief of Kimberley, encountered the enemy at Belmont and at Eslin and Graspan, and after crossing the Modder River caused them to retire to Magersfontein. Here, however, he was defeated by the Boers, while Gatacre met with disaster at Stormberg, and Buller was repulsed at Colenso. These reverses brought Lord Roberts on the scene, in chief command, with large reinforcements, including Canadian and Australian volunteers and some irregular forces raised in Natal and Cape Colony. With Lord Roberts came Lord Kitchener as chief of his staff. By this time the British had, all told, about 90,000 men in the field, opposed to the Boer's total force, in the neighborhood of 60,000. Subsequently was added to the British strength a new division, the sixth, which was now ordered to be mobilized and forwarded to the Cape.

Early in January (1900) the Boers made a determined assault upon Ladysmith, which, though repulsed, entailed great loss to both sides. Later in the month occurred the sanguinary affair at Spion Kop, where the British, after carrying the position, were in turn driven back and forced to retreat beyond the Tugela, with a loss of some 2,000 men. A fresh advance was made on Feb. 5, as far as Vaal Krantz, but after three days' terrible fighting a new retreat was ordered. About this time a large British force, under General French, advanced to the relief of Kimberley, and the siege was raised Feb. 15, 1900. From this time the tide turned against the Boers. The British force, augmented to 200,000, under the able leadership of Lord Roberts, pressed forward on strategic lines, and the Boer armies, though fighting with obstinate valor, were forced to give way. After severe fighting at Kooders-rand and Dreifontein, when the Boer army, under General Cronje, was beaten, General Roberts entered Bloemfontein, the capital of the Orange Free State, on Mar. 13, 1900. General Buller, after prolonged fighting, raised the siege of Ladysmith on Feb. 28, and relieved the long-beleaguered army of General White. A final and determined assault by the Boers upon Mafeking was repulsed, and on May 18 it was relieved by the British under Lord Roberts. The British now invaded the Transvaal, and, advancing, entered the great mining city of Johannesburg on May 31. President Kruger and his cabinet now fled from Pretoria, and General Roberts, after releasing 3,200 British prisoners at Waterval, entered and took possession of Pretoria June 5.

The Boer forces made no further determined stand against the British, but under the leadership of Generals Botha and De Wet, continued an active desultory warfare, cutting the lines of the enemy and attacking detached bodies of British troops with great bravery and varied success. Peace articles were signed May 31, 1902, by which the Boers made final surrender, and British supremacy was established. The loss to the British in the conduct of the war was more than 20,000, including killed in action and died of wounds and disease, besides more than 40,000 sent home as invalids, while the cost of the war to Britain alone from 1899 to 1903 was $937,000,000. The Boer total losses, beside 32,000 taken prisoners, included 3,700 killed or died of wounds. See Sir A. Conan Doyle's *The Great Boer War* (London, 1902).

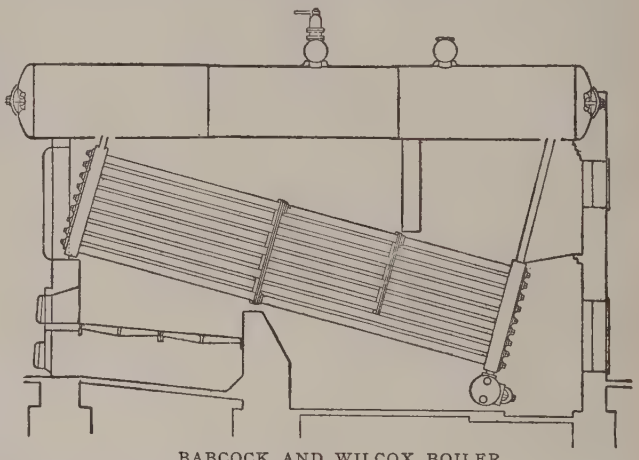
**Bogota** (*bo'go-ta*), the capital of the Republic of Colombia or New Granada, stands on a tableland of 450 square miles in area, at an elevation of 8,694 feet above the sea and is surrounded by mountains. The city was founded by the Spaniards in 1538, and has a population of 150,000. Although the surrounding plain is fertile and the mountains abound in valuable minerals, such as iron, coal and salt, and probably the precious metals, yet as a rule the people are greatly impoverished in consequence of the difficulty of transportation across the mountains. There are at present few manufactures. The city teems with churches and possesses, besides a fine capitol and other official buildings, a mint, a university, a number of schools, a free library, observatory, two theaters and several museums. It also supports forty journals, so that its people claim for their city the title of the Athens of South America.

**Bohe'mia,** formerly one of the kingdoms of Europe, now the most northern province of the Austro-Hungarian monarchy. It has an area of 20,060 square miles, or considerably less than West Virginia, and a population of 6,318,697. It contains nearly 400 cities, of which the largest is Prague, the capital of the kingdom and third city of the empire, with a population of 201,589. The country is enclosed on all sides by lofty mountains, which abound in mineral wealth, silver, tin, copper, iron, porcelain, clay, etc., while more coal is mined in the kingdom than in all the other provinces of the Austrian empire. The Elbe and its numerous branches water the soil, and grains and fruits are extensively raised. Its manufactures are important; dyeing and calico printing, linen making and flax spinning, glass works (which afford work to 27,000 persons) being among the principal industries. The Elbe and Moldau, an extensive canal, good roads and a system of railroads of nearly 3,000 miles in extent supply the means of carrying on a large transit trade. The people are mainly Czechs, Germans and Jews. Among them education is much more wide-spread than in any of the other provinces of Austria. The University of Prague has over 3,000 students, and there are a large number of other schools. Bohemia sends 110 members to the lower house of the Austrian reichsrath or parliament of the western part of the empire. It has a provincial diet of 242 members, competent to legislate on all matters not reserved to the reichsrath. The Czechs, a Slavic race, came into the country as early as the 5th century, A. D., driving out the earlier inhabitants. From that time Bohemia came under the power of various nations, and was at one time an elective kingdom; but in 1526 it became a part of Austria, and its history since that time has merged with that of Austria. There has been for some years a continual struggle between the Germans and the Czechs for supremacy. The Czech language is one of the most cultivated of the Slavonic dialects, and recently there has been a revival in its study as well as in Bohemian literature. The martyr John Hus was a Bohemian.

**Boileau** (*bwä'lō'*), **Nicholas,** a French poet and critic, was born at Paris in 1636, and after a thorough education took up writing as a profession. His first work was a satire, *Adieu of a Poet to the City of Paris.* He became a friend of Molière, La Fontaine and Racine, and was pensioned by the king. His *Art of Poetry* is considered very fine. He did much as a critic to purify and refine the French language, and has had a great influence on French literature. He was made a member of the French Academy. He died at Paris in 1711.

**Boiler,** an apparatus for generating steam by heating water. In its ordinary form it consists of the following parts: a furnace in which the fuel is burnt; a chimney or other means of producing a draught and of removing the products of combustion; a vessel containing the water, this vessel so arranged that the heat from the furnaces reaches the water; a steam space connected by pipes with the engine or other device in which the steam is used; a pump or injector for supplying the boiler with water; various devices for safety and convenience of operation, such as steam-gauge to indicate the pressure of the steam, a water-gauge to indicate the amount of water in the boiler and a safety valve to release the steam if it is beyond a safe pressure.

Boilers have various forms, depending upon the purposes and the conditions of their use. The object in each case is to produce with safety the greatest amount of steam at the least cost of fuel, of operation and of maintenance. In the earlier days pressures of only three or four pounds per square inch were used, but to-day 100 and 150 pounds are the common pressures for engines, and double these pressures can hardly be said to be uncommon. These higher pressures demand increased strength in the construction of the boilers. A few years ago cast and wrought iron were much used, but only steel is used in the best boilers today. The cylindrical form is universally used, as that is the strongest and most convenient form to stand internal pressure.



BABCOCK AND WILCOX BOILER

Boilers may be divided into two general types: (1) those in which the furnace and

heating flues are inside the water-vessel and (2) those in which the furnace is external to the water vessel. The first type is not much used in this country for stationary boilers, but it is commonly used for locomotive and marine boilers. The locomotive boiler consists of a fire-box of rectangular form which is more or less surrounded by the long cylindrical water-vessel. A large number of tubes run from the fire-box to the smoke-stack through the water-vessel, and thus allow the heat from the hot furnace gases to reach the water. The common stationary boiler in this country belongs to the second class. In its simplest form it is a single cylindrical vessel placed over the furnace and its hot flues. As more commonly used now, it consists of a large number of water tubes, the furnace gases passing around these tubes and thus heating the water. The Babcock and Wilcox boiler is one of the best of this type. The water is contained in a large number of straight tubes which are inclined at an angle of about 15° from the horizontal and connected with a drum above, which contains part of the water and the steam. The furnace is below the tubes, and the hot gases pass up and along the water tubes. These are compact, efficient and safe, if properly constructed. When the tubes are straight, they have the great additional advantage of being easily inspected and cleaned.

Boilers are generally rated in horse-power, and as applied to boilers this is a conventional term. A boiler of 1 H. P. is one which evaporates 30 pounds of water per hour from feed-water of 100° F. into steam at 70 pounds gauge pressure.

**Boiling-Point,** the temperature at which a liquid is transformed into vapor. The boiling-point varies with different liquids, while it changes with the amount of atmospheric pressure to which it may be exposed. When the boiling-point is normal at the sea-level, in high altitudes, where the air-pressure is light, liquids boil more slowly. So well-known is this that the heights of mountains are approximately measured by ascertaining the degree of temperature at which water boils. In highly elevated regions many substances cannot be cooked by boiling. A further fact is that when water contains foreign substances in solution the boiling-point is raised; in other words, the greater the amount of these substances a liquid contains, the higher within certain limits is the boiling-point of the liquid. Under normal atmospheric pressure, ether boils at 35° C., pure alcohol at 78°, while aniline boils at 183° C. Water boils at 100° Centigrade or 212° Fahrenheit.

**Bois de Boulogne.** See BOULOGNE.

**Boise** (*boi'zā*), **Idaho,** the capital of the state, and the county seat of Ada County, on the Boise River, about 48 miles east of its junction with the Snake River. It is reached by the Oregon Short Line Railroad (now part of the Union Pacific system.) It lies in an important mining district and besides a military post it has a federal assay office, U. S. Court and land offices, together with a soldier's home, a penitentiary and the state capitol. Its civic institutions, besides the city hall, include a public library, several schools and academies, a business college and a natatorium. The Boise River is utilized considerably in the region for irrigation purposes, as well as for water power for the city's manufactures. The latter embrace saw mills, wood-working factories, foundries and machine shops. In the vicinity there is much farming carried on, as well as stock-raising, while Boise has become noted as a wool market. Population, 25,000.

**Bo'ker, George Henry,** an American poet, was born at Philadelphia in 1823, and died there in 1890. He wrote several plays, which were successful on the stage, among them *Calaynos*, *a Tragedy*, and *Francesca da Rimini*. His war poems, written during the Civil War, were published in a volume entitled *Poems of the War*. He was appointed minister to Constantinople, and after four years was transferred to St. Petersburg. In 1882 he published a volume of verse, *The Book of the Dead*.

**Bokhara** (*bō-kä'rä*), meaning "treasury of sciences," a city of central Asia, the capital of the khanate or province of Bokhara, a vassal state of Russia, is situated on a plain near the river Zerafshan. It is more than eight miles in circumference, and is surrounded by mud walls twenty-four feet high, pierced by eleven gates. The palace of the khan, built on a hill at an elevation of 300 feet in the center of the city, is surrounded by a brick wall nearly seventy feet high. Bokhara is the center of religious life in central Asia, and is said to have 365 mosques. The finest occupies a square of 300 feet, and has a cupola 100 feet in height. Joined to it is a tower of about twice the height, from which criminals are hurled. The city has long been noted as a seat of learning, and besides a vast number of schools has about eighty colleges. The River Zerafshan is utilized for irrigating, and the drain of water is said to have lessened the population by one half, but there are still about 75,000 people. Silks, woolens and swords are manufactured, slave markets are held, and the bazaars are rich with the wares of Europe and Asia. The Transcaspian railroad opens communication with the ports of the Caspian Sea, but the trade is almost wholly in Russian hands. The area of the state of Bokhara is about 80,000 square miles, with a population of about 1,250,000.

**Boldrewood, Rolf.** See BROWN, THOMAS ALEXANDER.

**Boleyn, Anne** (*bo͝ol'ĕn*), queen of England and daughter of Sir Thomas Boleyn, subsequently Earl of Wiltshire and Ormond. She was born about 1507 and was brought up at the French court. She became maid of honor to Queen Catherine of England. The king, Henry VIII, was attracted by her beauty, had his marriage with Catherine declared void, and was married privately to Anne. She soon lost his favor, and on a charge of unfaithfulness was tried, condemned, and beheaded May 19, 1536. She was the mother of Queen Elizabeth.

ANNE BOLEYN

**Bolingbroke** (*bŏl'in-brŏŏk*), **Henry St. John, Viscount,** called the Alcibiades of his time, was one of the most gifted of English statesmen and orators. He was born at Battersea, near London, in 1678. He entered political life about the beginning of the reign of Queen Anne, on the side of the Tories, and by his abilities and eloquence soon became prominent. He was secretary of war and foreign secretary, and negotiated the Treaty of Utrecht in 1713. When George I came to the throne in 1714, Bolingbroke, who favored the Stuarts, fled to France. Some years later he returned to England and became associated with Swift and Pope and other men of letters. He tried in vain to get back into politics, and then spent another period of years in France, and died at the place of his birth in 1751. Besides his political writings, he wrote *Letters on the Study of History,* and the method here outlined is said to have been followed by Macaulay.

**Bolivar, Simon,** called the Liberator, was born at Carácas in what is now Venezuela, July 24, 1783. He studied law at Madrid, and traveled extensively, witnessing in Paris the closing scenes of the Revolution. After a visit to the United States, he returned to Carácas, determined to free his country from the yoke of Spain. Venezuela made her declaration of independence July 5, 1811, and the war began. Bolivar was soon forced to flee, but in 1812 he joined the insurgents in New Granada, and within a few months was able to enter Carácas as a conqueror, and proclaimed himself dictator of western Venezuela. But fortune now deserted him, and after a severe defeat he fled to Jamaica, where a hired assassin tracked his steps, but by mistake murdered his secretary. Gathering the insurgents at Hayti, he landed twice in Venezuela, and after defeating the Spaniards a number of times, a congress was opened at Angostura in 1819 and Bolivar was chosen president. Leading his army across the almost impassable Cordilleras into New Granada, a series of brilliant victories ended in the union of New Granada and Venezuela under the name of Colombia, and Bolivar was chosen president, Aug. 30, 1821. In 1822 he led an army into Peru, which he freed from the Spaniards. He became dictator of Peru in 1823, and made a tour through that country, in which he was received with enthusiasm. In his honor the southern part of Peru was named Bolivia and made a separate state, of which he was elected president. In 1826 he went back to Venezuela to quell a disturbance, and against his will was re-elected president. Many, in the meantime, had become jealous of his power; and when Venezuela separated from Colombia, in 1829, Bolivar in consequence laid down his authority. The congress of Bogotá, now largely made up of his enemies, however, voted him a pension of $3,000 on condition of his residing abroad. He died at San Pedro, Dec. 17, 1830. In 1842 his remains were removed to Carácas, where a monument has been raised to his memory. Statues have also been raised at Lima, at Bogotá and at New York, and his hundredth birthday was celebrated at Carácas in 1883, with exercises lasting over forty days, when sixteen foreign states were represented. Bolivar has been called the Washington of South America.

**Boliv'ia.** A republic on the west side of South America, having Brazil on the north, Brazil and Paraguay on the east, the Argentine Republic on the south and Chile on the west. Its area is 708,195 square miles, and its population is estimated at 2,267,935. It is eleven times as large as Illinois, and its population is much less than that of Chicago.

*Surface.* The western part of Bolivia is mountainous, containing some of the highest peaks of the Andean range. Among these are Illampu 22,500 feet, Illimani 22,500 feet. On the last named is Lake Illimani at an altitude of 15,950 feet above the sea. In this region is the lofty plateau of Oruro, with an average elevation of 13,000 feet, a length of 500 miles and a width of 100 miles. In the northern part are rich tropical valleys. The eastern section is level and heavily timbered. The great Lake Titicaca on the western border, with an area of 3,200 square miles and a depth of 120 fathoms, makes the northern plateau fertile. One of the islands in this lake was the home of the Incas or early rulers of Peru.

*Rivers and Railways.* The rivers of Bolivia feed the Amazon and La Plata. The Jurna and the Purus flow from Peru through Bolivia into Brazil on their way to the

Amazon. The most important rivers of Bolivia are the Bern and the Mamon, which with their tributaries drain the eastern section of the country and at the Brazilian boundary join to form the Madeira. Bolivia is poorly supplied with railways. A line runs from La Paz, the capital, west 56 miles to Ynaquai on Lake Titicaca, and an extension to Puno, Peru, which will give connection with the Peruvian port of Utollendo is projected. There is a railway from Oruro southwest 303 miles to Ollague, where connection is made with the Chilean railway to the port of Antofagasta.

*Climate and Resources.* Although lying entirely within the tropics, the varied elevation results in a wide range of climate and production, from the cold regions over 11,000 feet high, where crops are scant, through the temperate regions in the upper portions of the descending valley, which grow large supplies of grain, to the rich plains under 5,000 feet, which abound in all the wealth of tropical vegetation, including cotton, coffee, rice, cocoa, pineapples, bananas, tobacco and cinchona. Varieties of animals are found, among them the guanaco, llama, alapaca, jaguar, tapir, etc. In Bolivia, June, July and August are the winter months, December, January and February the summer months. The wet season extends from December to May.

*Minerals.* The mines of Bolivia have long been famous, especially those of silver, which yield annually about $10,000,000 and have yielded up to the present time over $3,000,000,000. Gold, copper and tin are mined to some extent. But while the mineral resources of Bolivia are exceedingly rich, including silver, gold, tin, copper, bismuth, iron ore, lead, marble, asphaltum, nitrate, anthracite coal and salt, yet the development of these resources has been greatly hindered by lack of transportation facilities. The decline in the price of silver, with the high cost of transportation, has led to the abandonment of many of the less productive mines. The manufactures of Bolivia are unimportant; no goods are made for export.

*Cities.* The chief cities of Bolivia are La Paz, the capital and the most important commercial city, population 78,856; Cochabamba, population 24,512; Potosi, population 23,450; Sucre, population 23,416; Santa Cruz, population 20,535; Oruro, population 20,670; Huanchaca, population 10,000.

*Government.* The form of government is much like that of the United States, with a president, two vice-presidents, a cabinet and two houses of Congress. The presidential term of four years is rarely observed, and for some years the history of Bolivia has been a record of military insurrections, the supreme power being held by successful generals. There are eight departments and one territory, the government of each being under national control.

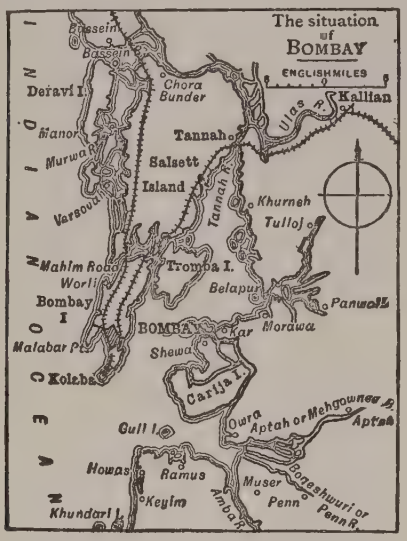
*History.* Bolivia came under Spanish rule in 1538; settlement began in 1578. Independence was declared in 1825 and the state was named in honor of the great liberator, Simon Bolivar. Its later history has been marked by insurrection and war. A war with Chile in 1879-83, although she was allied with Peru, ended in the loss of her coast district, including her rich deposits of nitrates. Her boundary disputes with Brazil and Peru were settled in 1903-04. The constitution of the republic was adopted in 1880.

**Bologna** (*bō-lōn'yä*), one of the most ancient cities of Italy, lies on a fertile plain at the foot of the Apennines, eighty-two miles north of Florence. The population is about 172,639. A high brick wall, with twelve gates, five or six miles in extent, surrounds the city; a canal flows through it, and the Rivers Reno and Savena flow past its walls. Many fine palaces adorn the town, rich in fresco-paintings by the great masters; but the most striking feature is the number of churches, there being over one hundred, beautiful in architecture and filled with treasures of art. Among them are San Stephano, rich in relics of the 11th and 12th centuries; San Petronio, the largest church in the city; San Domenico, where the founder of that order lived and died and where his tomb has been richly ornamented by Michael Angelo; and the cathedral dedicated to St. Peter. Two leaning towers stand in the middle of the city: Asinella, 274 feet in height, and Garisenda, 137 feet. Here also is the famous University of Bologna, claiming to have been founded in 1200, the oldest in Europe, whither students long flocked from all parts of the Old World. In the 13th century there were said to be 10,000 students; now there are about 1,700; and the library has 160,000 volumes, while the city library has 120,000 volumes. There are also an academy of music and one of arts, abounding in the works of those native artists who founded the great Bolognese school of painting. Bologna is older than Rome, and has been under the sway of several European powers. The city took an active part in the founding of the kingdom of Italy.

**Bolton** or **Bolton-Le-Moors,** a city of England in southern Lancashire, not far from Manchester, divided by the River Croal into Great and Little Bolton. It has long been celebrated as a manufacturing town, even as far back as the time of Henry VIII. Its cotton manufactures are especially important, there being more than 100 cotton mills, with about 4,000,000 spindles. There are also foundries and iron works, paper mills and dye works. It is an important railroad center. In the *Bolton Evening News* this city was the birthplace of the daily evening press. It sends two members to Parliament. Population, 168,215.

**Bombay** (*bŏm-bā'*), an important city of British India, occupies the entire breadth of

the southeast end of Bombay Island or peninsula and bordering on the harbor within and on Back Bay without. Its harbor is one of the finest in the world, having a space,




which is used for shipping, eleven miles long by four broad. Among the cities of India it is the most European in appearance. Besides the business blocks and the suburban homes of many of the European residents, there are on the esplanade facing Back Bay, the university, senate hall, high court, offices of public works and a sailors' home; while east of Back Bay, near the fort, are the town hall, mint, cathedral and custom-house. The terminus of the Great Indian Peninsular Railway is the finest building in Bombay. Bombay is also the terminus of the Baroda Railway. An extensive system of wharves and docks provides for its enormous foreign trade, which now surpasses that of Calcutta. Wheat, shawls, opium, coffee, pepper, ivory and gems are the products exported. There are sixty large steam mills, while added to the chief industries are dyeing, tanning and working in metals. The island was owned by the Portuguese in the 16th century and was ceded to England in 1661 as part of the dowry of Catherine, bride of Charles II. The population is 972,892. The British presidency of Bombay has an area of 123,064 square miles, with a population of 18,559,561, including Sind and Aden.

**Bonaparte, Charles Joseph,** lawyer and reformer, was born in Baltimore, June 9, 1861. He is the grandson of Jerome Bonaparte, King of Westphalia, whose romantic marriage to Elizabeth Patterson was practically annulled by Napoleon. Mr. Bonaparte was admitted to the bar in 1874, and soon became prominent as a political reformer. He was chairman of the council of the National Civil Reform League and president of the National Municipal League. He was a member of the Board of Indian Commissioners, 1902-04; Secretary of the Navy, July, 1905-December, 1906; and from December 17, 1906, to March 5, 1909, was attorney-general of the United States.

**Bonaparte, Elizabeth Patterson,** the first wife of Jerome Bonapart, was born at Baltimore, Md., Feb. 6, 1785, and died there April 4, 1879. As Napoleon I refused for reasons of state to recognize the marriage with his brother Jerome, which had taken place in December, 1803, and prevented the lady from landing in France, when she accompanied her husband to Europe, Mme. Jerome Bonaparte was compelled to seek an asylum in England, during which, at the instigation of the great emperor, she was divorced from Jerome and afterward returned to the United States.

**Bonaparte, Jerome,** youngest brother of Napoleon I and at one time king of Westphalia, was born at Ajaccio in November, 1784, and died near Paris in June, 1860. Early in life he became a midshipman in the French navy, and in 1801, when on an expedition to the West Indies, his ship was chased by English cruisers and Jerome Bonaparte had to take refuge in New York. Toward the close of 1803, while still sojourning in America and not yet twenty, he married Elizabeth Patterson, daughter of the president of a Baltimore bank, a marriage which his brother, the emperor, refused, however, to recognize, and it was declared null and void. In 1807 his brother created him king of Westphalia, and he then married Catherine Sophia, princess of Würtemberg. The battle of Leipsic (October, 1813), which virtually secured the liberation of Germany, cost Jerome his kingdom and made him an European wanderer until the advent of his nephew, Louis Napoleon. After the *coup d' état*, Napoleon III made him a marshal of France, president of the senate and governor-general of *Les Invalides*.

**Bonaparte, Joseph, King of Spain,** member of a famous family and eldest brother of Napoleon, was born at Corte, in Corsica, in 1768. He proved his ability in a number of important offices, among other services negotiating a treaty of friendship with the United States in 1800. After the coronation of Napoleon, Joseph was made commander-in-chief of the army of Naples, then ruler of the two Sicilies and in 1806 king of Naples. Two years later he was transferred to the throne of Spain, but found himself unable to suppress the Spanish insurgents, and after the defeat of the French, in 1813, returned to France. After the battle of Waterloo, he came to America, became a citizen of Bordentown, N. J., and followed the pursuit of agriculture. He returned to

Europe in 1832, and died at Florence in 1844. He was the only one of the Bonaparte brothers for whom Napoleon professed to care anything, though he was too humane in his ideas of government for his imperious brother.

**Bonaparte, Louis** (1778-1846), one time King of Holland, father of Napoleon III and brother of Napoleon I, his other brothers being Lucien, Joseph and Jerome. All were sons, together with four daughters, of Charles or Carlo Bonaparte of Corsica and his wife Letitia, the latter a patrician lady of strong-minded and accomplished characteristics. Born at Ajaccio, he was educated at the artillery school at Chalons, and early entering the French army he took part in his famous brother's successes over the Austrians at Arcola and Rivoli, in 1796-97. Under pressure from Napoleon I he married in 1802 Hortense de Beauharnais, but in consequence of incompatibility they separated five years later; while Prince Louis became King of Holland in 1806, though declining to sacrifice Dutch interests to his brother's imperial designs, and he abdicated in 1810 and retired to Italy. Meanwhile, Holland was annexed to France, but remained French for only three years, when the latter were expelled and the *House of Orange* was restored. Louis's separated wife, Hortense, was a rather notable authoress in her day, as well as a song writer, being the author of the one-time French national air, *Partant pour les Syrie*. Her third and putative son was Napoleon III; she died in 1837. Louis Bonaparte is also known as a writer of some note, among his works being a *History* (in French) *of the English Parliament* and a collection of *Documents on the Government of Holland*. In later years he became an invalid, and after the escape of his son, Louis Napoleon, from Ham, he removed to Leghorn, Tuscany, where he died.

**Bonaparte, Lucien, Prince of Canino,** and brother of Napoleon, was born at Ajaccio in 1775. He was well educated and filled a number of important offices. He was president of the Council of Five Hundred when Napoleon entered Paris, and by his energy greatly distinguished himself. As minister of the interior, he encouraged education, art and science, and as ambassador to Madrid he performed valuable services. He was a republican in belief, and opposed the absolute rule of his brother and refused the thrones of Italy and of Spain. The pope made him prince of Canino and Musignano. In 1810 he sailed for America, but was captured by the British. He alone showed presence of mind after the defeat of Waterloo. In later life he resided near Rome, and died at Viterbo in 1840. He had a good deal of talent, and was fond of science and the arts.

**Bonaparte, Napoleon.** See NAPOLEON I and NAPOLEON III.

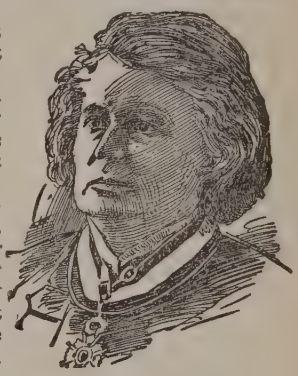
**Bond,** an obligation, is a written instrument, signed and sealed, in which one party to the negotiation—the borrower, styled the obliger—agrees to pay money to another, the obligee, generally on certain precisely defined and set forth conditions, and at a definite period. The amount of the liability to be incurred upon a breach of the conditions in the bond is usually set forth in the instrument, and in the case of default or failure to fulfill the terms and conditions of the instrument, the bond is said to be forfeit, and suit can be instituted for recovery, and that commonly with penalty, or claim for damages added. A bond, in other words, sets forth (1) an engagement to pay money in return for certain privileges granted or payments made, and (2) the conditions on which the engagement to pay back will become good and operative, or, otherwise, void and inoperative. When the bond is given for the performance of an act, recovery can be sued for in court for non-performance of the act, *plus* an amount in the way of damages to the obligee for what loss or losses he may have sustained in consequence of such non-performance. A bond may be made either by or to a single individual or by certain parties jointly to other interested parties, jointly and severally stated. In some cases, moreover, with the bond is handed over to the obligee some security, or it may be a mortgage, upon the property and effects of the debtor or obligor. Bonds can be made and are often issued by corporations, which in the interests of their trusts or concerns have to borrow money to exploit and advance them; and in default of meeting and satisfying these bonds at maturity the corporations can be proceeded against, sued and recovered from, as such in the courts. Governments, national and state, as well as cities and towns, are often at times under the necessity to issue bonds as negotiable security for considerations named or money loaned them; similarly, when in default, such can be sued and recovered from, just as in the case of private individuals or corporations. The bonds of single individuals, as well as bonds jointly made, commonly bind their maker's heirs, executors and administrators, in the instruments conveyed, and in the last resort these latter can be proceeded against as in the case of the primary and single defaulter.

**Bond, Sir Robert.** The Right Honorable Sir Robert Bond, P. C., K. C. M. G., LL.D., has been Premier and Colonial Secretary of the Colony of Newfoundland since 1900. He entered the Legislature in 1882, and was elected Speaker of the House of Assembly in Newfoundland in 1884, and became Colonial Secretary with a seat in the cabinet in 1889. He was authorized by the Home Government to assist Lord Pounce-

foote in 1890 in negotiating a reciprocity treaty with the United States, and was instrumental in carrying through the Bond-Blaine convention. In 1892 he was a delegate to Canada on the North American fishery question. In the great financial crisis which overtook Newfoundland in 1894 his strong action and able championship of the cause of the colony in financial circles in London preserved the autonomy of the colony, and established a claim on Newfoundlanders of personal loyalty towards him which has steadily strengthened. In 1895 he was chairman of the delegation that proceeded to Canada on the question of confederation. In 1900 he was specially invited by H M Government to attend a conference at the Colonial Office on the French Treaties Question In 1902 he was a member of the conference of colonial prime ministers held in London In the same year he was authorized by H M. Government to negotiate a treaty of reciprocity with the United States on behalf of the Colony of Newfoundland, and succeeded in negotiating the Hay-Bond treaty In 1904 he was invited by H. M. Government to assist in drafting regulations for the carrying out of the Anglo-French convention. He represented Newfoundland at the Imperial Conference in 1907.

**Bone** is the hard material of the skeleton of most animals. The office of bones is to furnish a building-structure or framework for the body, to support the soft parts, and protect delicate organs from injury, and by means of joints, to form a series of levers. Bone is white in color, but in the living body has also a pink and bluish tint. It is elastic and very tough, twice as strong as oak. Arab children are said to make good bows of the ribs of camels. Bone is made up of two parts, an earthy substance and an animal substance. By long burning the animal matter may be got rid of and the rest falls apart in a powder. By soaking in an acid the earthy salts, as they are called, may be dissolved out, leaving a tough and bending substance. Bones are of three shapes: long, as the armbone; flat, as the shoulder blade; and short and irregular, as those of the wrist. The bony substance is also formed into compact and spongy bone, the compact or dense forming a shell around the spongy or loose texture. The spongy texture is made up of numerous bars which unite together in the form of a lattice-work, light, but very strong. The compact texture is also full of holes, which are so small that they can be examined only by a microscope. These holes are the mouths of canals, which form a complete network of tubes, containing blood vessels which supply the bone with nourishment. For bones grow and must be kept alive like other tissues of the body; they start as a mass of cells, and only become true bones after a long process. Bone is also covered outside with a coating of membrane, in which blood vessels and nerves branch in all directions and join the interior net-work. The shaft of long bones is hollow; in some birds and other animals this space is filled with air, but in animals like man it is filled with a matter called marrow. This shaft is also lined with a membrane pierced with vessels. Besides all the small blood vessels that have been named, there is also a larger one which runs diagonally into the center of the bone. Bone is useful in medicine and cooking and in many other ways. (See SKELETON, etc.)

**Bonheur** (*bō'nĕr'*), **Rosalie,** a celebrated French animal painter, was born at Bordeaux in 1822. She made a study of animal life and in that department achieved great distinction. *Ploughing with Oxen Ploughing in Nivernais* and *Horses in a Meadow* are among her well-known paintings. The *Horse Fair* was bought for over $50,000 by Mr. C. Vanderbilt and placed in the Metropolitan Museum of Art at New York.



ROSA BONHEUR

She long directed a school of design for girls. She received several medals, also the decoration of the Legion of Honor. During the siege of Paris her studio and residence at Fontainebleau were spared and respected by special order of the then crown prince of Prussia. She died May 25, 1899.

**Bon'iface,** the name of nine popes, most of whom are of no historic importance. Boniface VIII., a native of Anagni, was elected pope in 1294. He was inaugurated with great pomp, the kings of Hungary and Sicily holding the reins of his horse, and, with their crowns upon their heads, serving him at table. He failed in many of his attempts to assert the papal power in temporal affairs, and was made prisoner at Anagni by Philip the Fair of France. He was freed by the people of Anagni, and died at Rome soon afterward in 1303. He is mentioned by Dante in *The Inferno.*

**Bon'iface, Saint,** "The Apostle of Germany," was born in England about A. D. 680. Becoming a priest when thirty years old, he was sent by the pope to preach the Gospel to all the tribes of Germany, who as yet were pagans. Traveling through the country, he baptized multitudes and changed their idolatrous groves into churches. He was made a bishop, then archbishop and

finally papal legate of all Germany. He founded churches and convents, and, scattering English priests, monks and nuns throughout the land, established many of the bishoprics which still exist. While working among the Frisians, an armed band of heathen fell upon him and killed him, with the converts who were with him (755). His remains were buried in the abbey at Fulda, which he had founded, and where there is still shown a copy of the Gospels written by him, with a leaf stained by his blood.

**Bonn,** a city of Rhenish Prussia, lying on the left bank of the Rhine. It is chiefly famed for its university. This great institution has about 185 professors and lecturers and 3,275 students, a library of 250,000 volumes, a splendid laboratory, an art museum, an observatory, a botanic garden and various other valuable collections. There is also a celebrated agricultural academy. Among the famous professors of the university were the great historian Niebuhr and the philosopher Schlegel. Niebuhr, Bunsen and Schumann lie buried in the minster of Bonn, which is said to have been founded by the Empress Helena in 320; and near it is a monument to Beethoven. Population about 87,967.

**Bonython, Sir John Langdon,** editor and proprietor of the Adelaide *Advertiser*, was born in London, Oct. 15, 1848, and educated at the Brougham School in Adelaide. He is also the owner of the Adelaide *Chronicle* and the *Evening Express*. He holds many positions of distinction in connection with educational institutions and was elected as representative of the state of South Australia to the first parliament of the Commonwealth.

**Book** (Saxon *boc*, meaning *beech*). In early times many different things were used as the materials of writing. The Babylonians and Assyrians preserved their writings either on papyrus, made of reeds, which grow in warm countries, or more commonly on brick clay, baked into square or cylindrical shapes. The Egyptians used papyrus (see PAPER) as early as 2000 B. C., and its use spread to Greece and Rome. It was rolled up on a stick, forming what is now called in Latin a *volumen* (roll), from which we get our word volume. One of these rolls has been found forty yards in length. Later on, carefully prepared skins or parchment became more common; while the Romans used a flat wooden board or sheet of metal covered with wax, upon which they scratched with a sharp pointed instrument called a stylus. In the middle ages, when books were written by hand on parchment and later on paper, four, five or six sheets were commonly used, folded in the middle, making twice as many leaves. When printing was introduced, the same plan was at first used, only one page being printed at a time. It later became common to print several pages at once, the paper being folded and cut into pages afterward; the number of times it had to be folded showing the size the book was to be. Even to-day the same words are used to describe the size of a book; one where sheets are folded once down the middle, making two leaves, being called a folio; if the sheets are folded twice, making four leaves, it is called a quarto, etc. But as the size of the original sheet now varies considerably, these terms do not tell accurately the size of the book. Books vary in size from the *Thumb Bible*, which is a little larger than a postage stamp, to certain church books which are described as six feet high and four feet broad. Titles of books used to be very long, sometimes covering nearly the whole title-page; and the preface and dedication were formerly much more elaborate than now. Illustrations have been used in books for a long time. When books were written on parchment by hand, the ornamenting of the margins and the lettering were often very elaborate.

BOOK BINDING before the days of printing and for a long time after was done by hand, the cover usually being made out of prepared skin and often ornamented with gold and jewels. At the present day books are usually sent to the binder as unfolded sheets of thirty-two pages each, the pages being already numbered. The folding is usually done by a machine, though sometimes by hand. One from each bundle of folded sheets is taken and they are laid together according to the number of the sheets, then pressed solidly together in a machine and sewed. After this the edges are cut and the book rounded on the back to make projections or joints to hold the cover firm. The cover has already been prepared by pasting a special kind of cloth over two pieces of pasteboard, keeping them as far apart as the width of the book, and by stamping the ornamental design on the outside. The outside paper of the book, together with the threads on which it is sewed, is then pasted to the inside of the covers and the book is put into a hydraulic press until it is dry. The binding of books in leather is a slightly different process.

**Book-Keeping,** a method of recording the transactions of business houses by a system which shall show with ease and exactness on inspection, the extent and soundness of the business done by a merchant, trading firm or corporate company engaged in business operations, while setting forth the extent of the resources and liabilities, losses or gains, together with the capital and stock in trade, of such merchant, firm or company doing business. In the case of partnership firms—and indeed the case of all—the necessity of keeping books of account and of having recourse to a system of book-keeping, either by Single or by Double Entry,

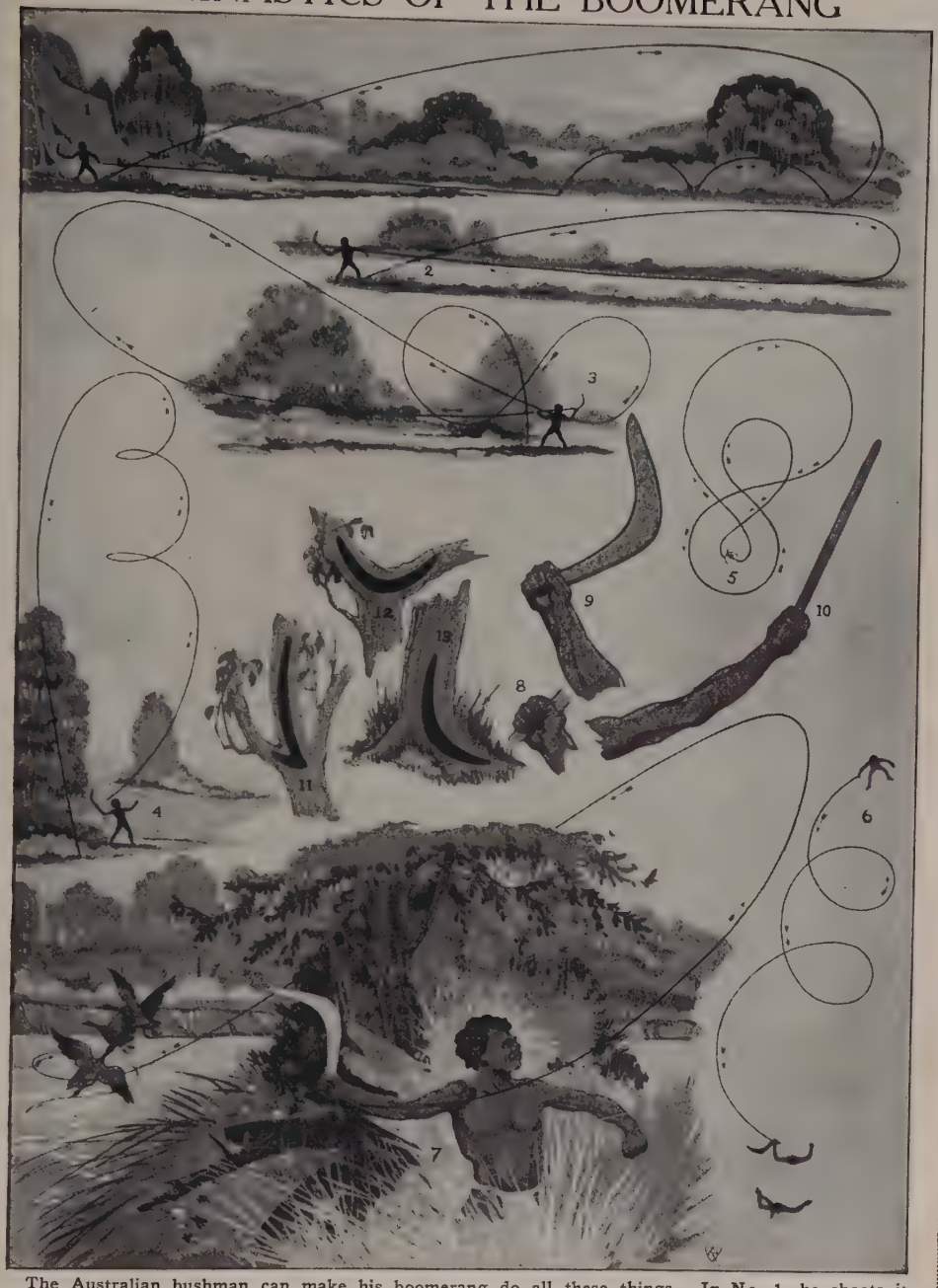
will be apparent and obvious; while it is vital to the exigencies of any merchant or firm doing a more or less large business and desiring to do with precision and exactness a financially correct and sound business. The two systems of bookkeeping are (1) that by Single Entry, the simpler of the two, and (2) that by Double Entry, both being in use as the volume of trade calls for. Under the former, the books in use are a Cash book, Day book and Ledger; under the latter, a Journal is called for in addition. By both systems the transactions recorded in either set of books should for accuracy be checked over at least monthly, and an abstract or resumé made, and more especially so if the business done is on a large scale. The Single Entry system is mainly used where transactions can be simplified, if on a small scale, as in the case of retail merchants where it is necessary to record only the purchases and sales for cash or credit. The more satisfactory, though more intricate, system of Double Entry is resorted to where business is done on an extensive scale, calling for the record of a transaction or sale first on the debtor or creditor side of an account, and again on the contrary side of some other account. By the latter system the merchant can more readily inform himself of the exact state of each account, and not alone of the goods sold, but of what he has on hand, without the necessity of first taking account of stock. Transactions in which cash plays a part are entered first in the Cash book, after the same manner as entries are made in the Day book, i.e., after setting forth the customer's name and date of the entry, with the term Dr. or Cr. annexed, according to the nature of the transaction—Dr. when goods are sold, and Cr. when goods are bought or received. Goods bought on credit are entered under "Cr." and the entry should be preceded by the word "By;" when they are sold on credit, add "Dr." to the purchaser's name and residence, and precede the entry with "To." The Ledger in both systems is the most important of the books, and under the Double Entry system into it are transferred the entries under their separate heads from the Journal—each item being entered twice, once on the Dr. side of an account and once on the Cr. side of another account. Many firms have subsidiary books, such as a Petty Cash book, which is usually balanced monthly or oftener and its total expenditures are transferred to the Cash Book proper, under the head of Petty Cash. The other books embrace a Sales book, an Invoice and an Inventory book, and a Bills Receivable and Bills Payable book and Bank book, besides the balance sheets statedly utilized. The Bank book should, of course, show on the debit side the sums periodically deposited, and on the credit side the sums withdrawn—the remaining amount, unless the account should happen to be overdrawn, being closed "By Balance," to be carried forward to the new month's business. In the Double Entry system, where there is but one owner (without partner), a stock account should be opened, in which the owner is credited with his investment or capital, together with the gains of the business, and debited with all sums withdrawn and liability assumed, as well as with the losses incurred, if there be any. Similarly, the Merchandise account should be debited with the original sum invested as the purchase money of the concern, and credited with the sales and the amount of stock on hand, when ascertained. When the stock has all been sold, or the amount on hand figured out, the account will, of course, show the resultant gain, or loss, whichever may happen to preponderate. In like manner, Bills Receivable are debited with the notes given or drafts accepted for purchases of stock, and credited when these mature and are paid. Bills Payable are similarly credited when the notes of the house, if any, are issued, and debited when they are redeemed and paid.

**Boom'erang,** an instrument used by the natives of Australia in hunting and war. It is about two feet long, flat on one side and rounded on the other, with a sharp edge. It is made of hard wood bent into a curve. The method of using this remarkable weapon is as follows: taking it by one end with the bulged side downward, the Australian throws it forward as if to hit an object some yards in front. Instead of going straight forward, it slowly rises in the air, whirling round and round in a curved line, until it reaches quite a height, when it begins to fly back again, and, sweeping over the head of the thrower, falls behind him. This surprising motion is produced by the action of the air on the bulging side of the boomerang. The Australians have a remarkable skill in the use of this weapon, and it is said that with it they can almost cut an animal in two.

**Boone,** a city and county-seat of Boone County, Iowa, 36 miles from Des Moines. In the vicinity are deposits of coal, also fire and pottery clay, and the city is engaged in the mining and shipping of coal and the manufacture of pottery, tiles, brick, flour, etc. Boone has a public library, a hospital and the service of three railroads. Population, 12,253.

**Boone, Daniel.** For more than a century this famous hunter and Indian fighter and pioneer, has fired the imaginations of the American boy and inspired biographer, orator and poet. Of the hundreds of backwoodsmen who, in Revolutionary days, broke across the Alleghenies, his personality is the most picturesque,

# GYMNASTICS OF THE BOOMERANG




The Australian bushman can make his boomerang do all these things. In No. 1, he shoots it ahead of him so that it strikes the ground, makes two loops and then one grand loop through the air back to his feet. In No. 2, it sails through the air and comes back again without touching the ground. In Nos. 3, 4, and 5, it is executing various other air maneuvers more complicated than those of the bird-man. No. 6 shows how a boomerang with a hook at the end can be made to catch on the shield of an opposing warrior and hop right over at him. In No. 7, the bushman concealed from view, is "shooting" a duck. Figures 11, 12, and 13 show how boomerangs of different shapes are cut out of trees.

his character the most admirable and his life the longest. Born on the frontier in Pennsylvania in 1735, he lived on the frontier in North Carolina, blazed a way through the Kentucky wilderness for settlers, and died at an outpost of civilization in Missouri in 1820. The spirit of the red man was no more alien to the settlement than was Daniel Boone's. In the eighty-five years of his life he never lacked "elbow-room," free land, stirring adventure, game for his unerring rifle or courage and resource to meet danger.

DANIEL BOONE

The boy who fancies this the ideal career does not realize the rough schooling that was the necessary preparation for it. Except for the scattered clearings, the valley of the Schuylkill, where he was born, was wild pasture and untamed forests. His parents were Quakers, and they and their Quaker and Dutch neighbors were dependent for a living more upon hunting than upon crops. So the boy grew up in the wild, strong, brave, inured to hardship and as skilled in woodcraft as an Indian. Scarcity of game forced the family to emigrate to the high western valley of North Carolina. There, at the age of 21, Boone married. When he was 24, he joined a party under the guidance f John Finley, and by way of the old Indian trail across Cumberland Gap broke into the hunter's paradise of Kentucky. Contrary to popular belief, Boone was not the first white man in Kentucky, and, as a permanent settlement, Harrodsburg antedated Boonsboro by a year. His son Enoch was, however, the first white child born in the state (1777), and Boone, as justice of the peace, celebrated the first marriage ceremony (1776). The hero of border warfare, he is, as a military figure, insignificant beside George Rogers Clark. But in the mischances of frontier life, with daring men constantly making early and violent exits from the stage, Boone seemed to bear a charmed life. For half a century he slept with his food-pouch filled and his moccassins tied to his gun-stock. His adventures are more stirring than those of the most lurid dime novel.

Such was his fame that, when he emigrated to Missouri in 1792, the Spanish government gave him 8,000 acres of land and made him commandant of the Osage district. There he dwelt in patriarchal state, his sons and daughters around him, for nearly thirty years, hunters, explorers and emigrants taking counsel of his wisdom. For artists he seems to have had great fascination as a subject, and several went out to paint his portrait. One has described him in old age as of medium height but erect and athletic. His head was of noble shape, with a high, bold forehead, his mouth wide and thin-lipped, his eye a clear blue and of direct gaze. Courage and honesty were his patent traits; his expression was mild, his manner amiable. He was unspoiled by his great reputation, and remained the simple, unlettered child of nature to the last. At eighty-two years of age he looked ten years younger, and went off on a long hunting trip to the Kansas River. He died suddenly in his 86th year, and his bones were removed to Frankfort, Kentucky. His adventures, as told by himself, are edited by John Filson. The latest and best biography is by Reuben Gold Thwaites.

**Booth, Edwin Thomas,** one of the greatest of actors, a son of Junius Brutus Booth, was born at Belair, Maryland, in November, 1833. He was educated for the stage, and early appeared in several minor parts with his father; and on one occasion filled successfully his father's place as Richard III. He made a trip to California, then to Australia, and on his return to New York appeared as Richard III, and soon gained a high reputation for his playing of Shakespeare's leading characters, especially Iago and Hamlet. In 1861 he went to Europe, playing in England and studying his art on the continent. Returning to New York, he produced the play of *Hamlet* at the Winter Garden for 100 nights. In 1869 he opened a splendid theater in New York, devoted to the classic drama, at a cost of over $1,000,000. In 1880 and 1882 he visited England again and also Germany, and was received everywhere with enthusiasm. His career was one of the most brilliant in the annals of the drama. Besides the characters of Shakespeare he represented, his rendering of Richelieu, in Bulwer's drama of that name, won him fame. He died at New York, June 7, 1893.

**Booth, John Wilkes,** an American actor, notorious as the assassinator of Abraham Lincoln, was born in Maryland in 1838, and was shot on April 26, 1865, near Bowling Green, Va., while resisting arrest, by Sergeant Boston Corbett. His father was Junius Brutus Booth, from whom he inherited a touch of insanity. On April 14, 1865, while President Lincoln was attending a play in Ford's theater, in Washington, he was fatally shot by Booth, who exclaimed, as he did the foul deed, *Sic semper tyrannis* (ever thus to tyrants). The motive for the infamous

act was Booth's sympathy with the south in the Civil War.

**Booth, Junius Brutus,** a noted tragedian, was born at London in 1796. After essaying different professions, he made his first appearance on the stage in 1813. He was engaged for some time at Covent Garden theater and at Drury Lane theater, where he played with Edmund Kean, each taking alternately the characters of Othello and Iago. After traveling on the continent, he emigrated to America in 1821, and for thirty years played in nearly every theater in the country. His favorite characters were Richard III, Iago and Sir Giles Overreach; but he also excelled in Othello, Lear, Shylock and Hamlet. He stands in the first rank of tragedians. He died on board a Mississippi steamer in 1852.

**Booth, Rev. William,** the founder and "general of the Salvation Army," was born at Nottingham, England, in 1829. The work which led to the creation of the Salvation Army was begun in 1865, in the east end of London, and has been known by that name since 1878. The general was ever the mainspring and controlling power of the movement, directing its operations both at home and abroad from his headquarters at London. In 1890 he wrote a book called *In Darkest England,* in which he showed the wretched condition of the poor of London, and described the work the Salvation Army was doing for them, and the plans for future work. Many of these plans have been put in operation since the publication of the book. He died in London, Aug. 20, 1912. See SALVATION ARMY.

**Boothby, Guy Newell,** the novelist, was born at Adelaide, South Australia, Oct. 13, 1867. He crossed Australia from north to south in 1891, and has traveled extensively in the Orient. His works of fiction, which number more than a score, have attracted readers throughout the English-speaking world, being published simultaneously in England, Australia and the United States.

**Boots and Shoes.** In the United States the manufacture of boots and shoes in almost all their detailed processes and operations has set aside the former slow method of entire hand-work, and for many years has been extensively performed by machinery. If there is a hand process still clinging to their manufacture, it is that of cutting and shaping the leather for the uppers. With perhaps only that exception, the varied processes gone through, including skiving, welting, lasting, sewing and tacking, heeling, rounding, insoling, coloring and finishing are those of elaborately and ingeniously applied machinery. In the Old World machinery is not by any means so largely used, even in the case of military and hunting boots, those of grooms and jockeys and the elaborate Hessian, Wellington and other styles of jack-boots; nor is machinery used to any great extent, even in the turning out of ankle-boots and women's low shoes. Extensive also in this country is the manufacture of cloth and rubber boots and shoes, the trade in the latter being now an enormous industry in the New World, while the extent to which they are now exported is increasing.

**Borax,** a compound of boracic acid and soda, found as a saline incrustation in certain lagoons and lake shores chiefly in Persia, Tibet, Chile and Peru. It is also extensively procured in its crude forms in the dry lakes or in their muddy bottoms of California and Nevada, the production from the Pacific coast being valued annually at about $750,000. It is soluble in boiling water and has a slight alkaline taste. It is put to a variety of uses, but chiefly in a flux state in aiding the fusion of metallic mixtures, and in producing silicates in welding iron, in soldering metals and other brazing operations, as well as in making enamels and in fixing the colors on porcelain. It is, moreover, used as a food preservative and as a detergent in the laundry. In combination with glycerine it is also used as a disinfectant and antiseptic for sore throats and in the treatment of thrush in children's mouths. The crude native borax imported from Tibet, and once the chief source of boracic compounds, is known as tincal.

**Bordeaux** (*bôr'dō'*), the third seaport of France, lies in the department of the Gironde, on the left bank of the Garonne, about sixty miles from its mouth in the Atlantic, but easily accessible to ships. Trade by railroad and by the Garonne is very large. The principal industries are the making of sugar, cigars, calicos, woolen goods, paper, etc. In 1898, the volume of trade passing in and out of Bordeaux was in value 676 millions of francs. The wines of Bordeaux are noted, both the red wines, which are often called claret, and the white wines. The river is crossed by a noble bridge of seventeen arches, with a length of 532 yards. The city can boast of some of the finest examples of architecture in Europe, among them a large number of cathedrals and churches, and the Grand theater. Here also are schools of theology, medicine, art and science, an imperial college, a gallery of paintings, a museum and an observatory. Bordeaux is a very old city and has some Roman remains. When under English occupation, it was for awhile the seat of the splendid court of the Black Prince. Population, 260,000.

**Bordeaux Mixture,** the most generally used remedy for blights and other fungous

diseases of plants. It is applied as a dry powder by dusting or in liquid form by spraying (q. v.). Its advantage over other fungicides is its cheapness and its safety, as respects both operator and plant. Formula of the liquid form: water 50 gallons, quicklime three to six pounds, copper sulphate three to six pounds, depending on the plant treated. The dry mixture is made so that the copper sulphate will be the same chemical state as in the liquid; it is somewhat harder to prepare, but is lighter and often more convenient to apply. The chemical condition and therefore the efficiency of either form depend on the proper preparation. Consult *Bulletin No. 60*, Missouri Agricultural Experiment Station and *Farmers Bulletin No. 38*, U. S. Department of Agriculture.

**Borden, Robert Laird,** became premier of Canada after the defeat of the Laurier ministry on the reciprocity issue in 1911. He was born in Grand Pre, Nova Scotia, June 26, 1854, and educated at Acadia Villa Academy, Horton. He studied law and was called to the bar in 1878. He soon rose to a high place in his profession. In 1896 he became a member of parliament and was elected leader of the conservative party in 1901.

**Bore,** also called **Eagre,** a peculiar tidal effect at the mouth of certain rivers. When a river's mouth widens rapidly, and it is subject to high tides, the spring flood-tide drives an immense volume of water from the sea into the river. The water collects in the mouth faster than it can flow up into the river, and so there is gradually formed a kind of watery ridge stretching across and rushing up the opening with great violence and noise. It sometimes rises many feet. The most notable Old World bores are those of the Ganges, Brahmaputra and Indus. In one branch of the Ganges the bore travels seventy miles in four hours, and often it appears suddenly as a wall seven feet high.

**Boreas,** the north wind, was one of the nature gods in the Greek myths. He was depicted as an old man, with hair and beard flaked with snow and having wings. The Athenians built him a temple for assisting to wreck the fleet of the Persian monarch Xerxes.

**Borgia** (*bôr'jà*), **Cæsar,** whose father afterwards became Pope Alexander VI, was born in Italy in 1475, and at an early age entered upon a career of crime and ambition. A cardinal at 17 (A. D. 1492) and soon after captain-general of the church, he sought to push his way to power by the destruction of all who stood in his path. He planned a new kingdom of central Italy, and it required a league of all Italy and of the most powerful sovereigns of Europe to thwart his energy and ambition. The death of his father, who was his ally, and his own capture by his enemies put an end to his plans. He escaped and fled to the court of Navarre, but was soon after killed (1507), at the age of thirty-two.

**Borgia, Lucretia,** sister of Cæsar Borgia, a beautiful and accomplished woman, was born at Rome in 1480. During the lives of her father and brother, she was several times married to further their plans, but in later life, as the duchess of Ferrara, she was celebrated for her piety and love of art and learning. She died in 1519.

**Bor'neo** one of the islands of the Malay Archipelago, and the largest island in the world, lies in the Indian Archipelago, south of the China Sea. Its length is about 800 miles, its breadth 700, and its area, British and Dutch, 244,000, nearly as large as Texas. The population is about 1,129,889.

*Surface and Rivers.* The island is mountainous, reaching its greatest height in Kini-Balu, which is about 9,500 feet above the level of the sea. Unlike the other islands of the Indian Archipelago, Borneo has no active volcanoes. It has an extensive river system and many lakes, swarming with crocodiles, and many of the rivers are navigable far inland for boats of considerable size. The climate of the lowlands is unhealthy for Europeans, but the highlands have a more moderate temperature.

*Natural Resources.* The forests produce many valuable woods, oils and gums; the mohor tree, used for making boats, reaching a height of eighty feet, and the kaladang, suited for large masts, growing 200 feet high. The forests abound in wild animals; among them are the orang-outang, rhinoceros and elephant; and various birds, as the swift, which constructs the edible nests prized by the Chinese for soup. Among the abundant mineral resources of Borneo are valuable diamond mines.

*People and Products.* The inhabitants are Malays, Dyaks, Negritos and Chinese. The chief Dutch settlements are Sambas, Pontiana, Banjarmassin and Koti. Vegetation is luxuriant. Spices, rice, millet, sweet potatoes, cotton, indigo, tobacco, etc., are among the island products.

*Political Divisions.* The country is divided into districts, ruled by sultans; but foreign powers have obtained control of large portions. The largest portion of the island belongs to the Netherlands. British North Borneo, including Brunei, Sarawak and Labuan—all under British influence—has an area of nearly 42,000 square miles, with a coast-line of over 900 miles.

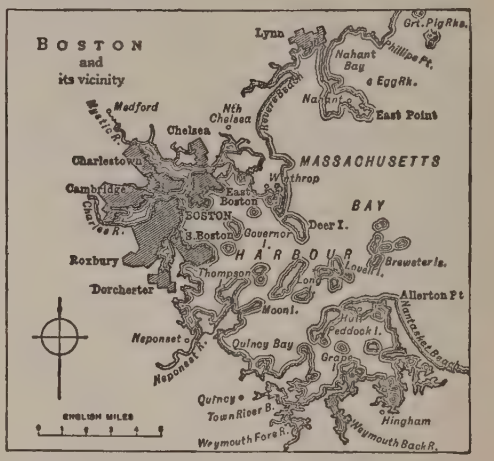
The Dutch have the control, directly or indirectly, of by far the larger part of the island, and have divided the southern part into the residency of the western division,

with the capital at Kuching (population, 9,000), and that of the southern and eastern, with its capital at Banjermassin (population, 30,000). Borneo was discovered by the Portuguese in 1518, and the Dutch visited the island in 1598, and in the 17th century made a settlement there. Population estimated at 500,000.

**Bos'nia, Herzegovina** and **Novi-Bazar** are provinces in the northwest of the Balkan Peninsula, formerly under Turkish rule, but now, by the treaty of Berlin in 1878, turned over to the Austro-Hungarian monarchy, of which it now forms a part. The joint area of the three is 23,570 square miles, about the size of West Virginia, and the population is over a million and a half. Bosnia is mountainous, covered with forests, and interspersed with beautiful valleys. Numerous rivers flow northward and join the Save, which forms the northern boundary. The capital is Bosna Serai or Serajevo, with a population of 38,000. The people are mainly Slavs, divided by religion into Mohammedans, Roman Catholics and Orthodox Greeks.

**Bosporus** or **Bosphorus** meaning oxford, from the legend that Io swam across it in the form of a cow, is the channel that separates Europe from Asia and connects the Black Sea and the Sea of Marmora. It was more particularly called the Thracian Bosporus to distinguish it from other straits to which the same name had been given. Throughout its length the strait has on either side seven bays or gulfs, with corresponding promontories on the other side. One of these gulfs, often called the Golden Horn, forms the harbor of Constantinople. The Bosporus is about seventeen miles long and from a third of a mile to two miles broad, with an average depth of about 180 feet. The banks are richly dotted with cypress, laurels and ancient plane trees, and covered with palaces, villages, villas and gardens. It was at the middle of this strait that Darius made his bridge of boats when he marched against the Scythians. The Bosporus has long been under the control of Turkey, and by common consent of the European powers, is closed to all but her own war vessels, though the sultan may open them to his allies in time of war.

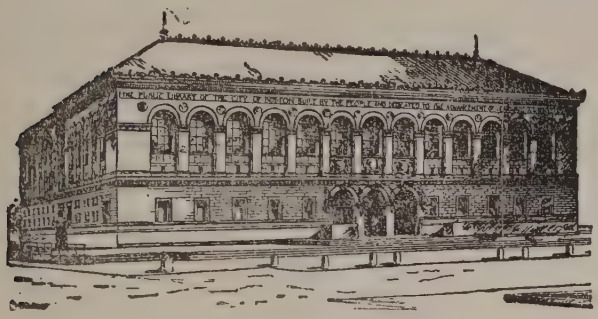
**Boston,** the capital of Massachusetts, the chief city of New England and the fifth largest city of the United States, stands at the western end of Massachusetts Bay, at the mouths of the Charles and Mystic Rivers. Founded in 1630, it was first called Trimountain from the three hills which then formed a marked feature of the landscape. Since that time it has taken a prominent part in the history of America. Here was published the first regular newspaper (1704), and the same Puritan spirit which led to the punishment here of heretics, Quakers and witches, contributed largely to the determined opposition to the oppressive measures of England which resulted in the Revolution. The Boston Massacre and the destruction of




the British taxed tea in the harbor are famous. Otis, Hancock, Samuel Adams and Warren were all Boston men. Boston has also done much for the literature and culture of America. Longfellow and Lowell, Whittier and Emerson, Hawthorne and Holmes, Thoreau and Parkman, Motley and Prescott dwelt in or near the Puritan City.

Boston has a fine system of parks, Franklin park (the largest) has an area of 527 acres. These parks are connected by miles of wide and handsome boulevards. Boston Common (48 acres) and the public gardens are greatly enjoyed by the people, because situated in the center of the business section of the city. The metropolitan park commission has secured and opened to the public a system of parks around Boston, including the Blue Hills Reservation, Middlesex Fells, Revere and Nantasket Beaches, tracts along several rivers, ponds and brooks, to the extent of over 12,000 acres and costing over five million dollars. The estimated area of the city is 42 square miles. In 1872 the city was visited by a destructive fire, which destroyed over 75 million dollars worth of property in the business section; but the evidences of this destruction have long since disappeared, and a new face was soon put upon the city's aspect. Among the historic buildings of the city are the State House, Christ Church, the old South Church, Faneuil Hall, called the Cradle of Liberty, and King's Chapel. The later noted buildings include Trinity Church, the Custom House Tower the Museum of Fine Arts, the Museum of

Natural History, the Chamber of Commerce, the new Symphony Hall, Opera House, the Massachusetts General Hospital, the Christian Science and the Spiritualist Church and the fine home of the Massachusetts Historical Society, the government postoffice, building built of granite, and various asylums, handsome club houses, beautiful homes in the residence district, etc. The city is adorned with statues and monuments: the great Bunker Hill monument and statues of Washington, Hamilton, Winthrop, Webster, Edward Everett, Charles Sumner, Josiah Quincy, Benjamin Franklin, Horace Mann and a score



BOSTON PUBLIC LIBRARY

of other noted Americans. Boston University, the Massachusetts Institute of Technology and Boston College are excellent institutions of learning. Educationally, Boston is noted for its great free library with numerous branches (containing over 1,000,000 volumes), its Boston Athenaeum, with a library of over 200,000 volumes, its fine school-houses, many special and suburban high schools, the large per cent. of pupils in the latter and its remarkable school attendance. Very few children of school age are on the street. Several of the great publishing firms are located in this city. Boston has large manufacturing interests, and is the principal mart for the sale of wool, shoes and leather. The surface and elevated electric cars pass under the Common and Tremont and Winter Streets, through magnificent subways built by the city.

In foreign trade the city holds the third place with New York first (the extent of its foreign commerce, exports and imports, reaching two hundred and sixty million dollars in amount), and 20 lines of ocean steamers ply regularly between this city and foreign ports. The railroad system of New England centers chiefly in Boston. There are two great union stations, the North Union and the South Terminal; the latter handles the world's largest number of passengers. The chief railways entering the city are the Boston & Albany, Boston & Maine, New York, New Haven & Hartford. The population of the city proper is 726,000 while the Metropolitan district—that is to say, taking in the city and its suburbs, has 1,600,000 inhabitants.

**Boston University,** located in the city of Boston, Mass., was chartered by the state in 1869. It has 150 instructors and over 1,400 students. It is a thoroughly equipped institution, and is noted for the facilities which it affords for advanced work in its graduate and professional schools. Massachusetts Agricultural College at Amherst is a branch of the university.

**Boswell.** See JOHNSON, SAMUEL.

**Bos'worth,** a market town of England, twelve miles from Leicester, near which was fought the famous battle of Bosworth, August, 1485. In this battle, the death of Richard III, who, deserted by his forces, had rushed into the thick of the enemy, crying "Treason, treason," ended the long civil wars of the Roses. At the close of the fight, the crown was found near a hawthorn bush, and was placed by Lord Stanley on the head of the new king, Henry VII, on an eminence which is still called Crown Hill.

**Bot'any.** The science which deals with plants. It should be understood in the outset that botany is one division of biology, and that it simply means a study of biology with plants as illustrative material. The history of botany is a very long one, but the real development of the science has taken place during the last century. Naturally, the first attention given to plants was to discover those which are useful to man for food, in the arts or in medicine. In fact, the medicinal use of plants was for centuries the only representative of a botanical science. A true science of botany, however, began with attempts to classify plants. Aristotle and Theophrastus had classified all plants as trees, shrubs and herbs, and there was no further attempt to develop a scientific knowledge of plants until the 16th century. It was then that students again began to arrange plants into groups, but these groups were very artificial. These attempts finally culminated in the famous artificial system of Linnæus, which was published in the middle of the 18th century and was in use to the middle of the 19th century. Since that time a great advance has been made in constructing what are known as natural systems of classification, which attempt to put those plants together which are really related. As a consequence, the subject of classification or taxonomy, as

it is called, is upon a very substantial basis. Taxonomy is the oldest phase of botany, but it continues to represent to many the whole subject. It is not unusual to meet people who think of botany as the analysis of flowers. Of course, taxonomy includes the classification of flowering plants, but it includes a classification of all other plants as well.

During the last part of the 18th century a new phase of botany began to be developed, which deals with the structure and development of plants and their organs. This became possible through the invention and gradual improvement of the microscope, so that the minute structures of plants could be investigated. At first botanists interested themselves merely in the structure of mature plant bodies, and as the knowledge of the cell gradually developed the field of anatomy came into view, which has to do with the various cell aggregates known as tissues which enter into the plant body. Later, however, botanists began to be more interested in the way in which the tissues are related to one another to form the plant body and its organs, and the science of morphology began to exist. This last subject for a time contented itself with the study of the forms of plants and their organs, but presently passed into the more important phase of studying the gradual development of plants and of their organs, subjects which are often called embryology and organography. Morphology not merely studies the development of structures, but it studies the relationships of plants which are thus revealed, and hence is interested in what is known as phylogeny, that is, the ancestral history of plant groups.

During the time morphology was growing another view of plants was being developed, namely, that which deals with their life processes, or the plants at work. A good many botanists cared not so much for the structures of plants as for the activities of plants, and plant physiology began to assume importance. This subject developed with exceeding rapidity during the 19th century, and is certainly one of the most important views which can be taken of plants.

During recent years still another field of botany has come prominently forward, which deals with plants in relation to their environment, and is known as ecology. Under this phase the necessary relations of plants and their organs to light, heat, soil, temperature, etc. are studied, and also those exceedingly interesting communities which are known as plant-societies.

These may be taken to represent the principal fields of botanical activity today, but there are other botanical subjects which are of more special development. For example, pathology deals with the diseases of plants, paleobotany with fossil plants, economic botany with plants in relation to the interests of man, forestry with the problems of the proper cultivation and use of forests. Still further subdivisions of the general subject are common. For example, a bacteriologist is one whose attention is devoted to the bacteria; the phycologist studies the algæ; the mycologist studies the fungi; the bryologist is a student of mosses, etc.

Any elementary knowledge of botany should include something from all the principal divisions of the subject. For example, a beginning student should know how plants must relate themselves to their surroundings in order to live (ecology). He should know how plants make food and use it, how they are irritable and respond to stimuli, and how they reproduce (physiology). He should also learn something of the essential structures of the great groups, so that he may know the make-up of a toadstool, moss, fern, flowering plant, etc. (morphology). He should also have some general knowledge as to how plants are put into great natural groups or families, and he should be able to discover the names of the important plants of his vicinity (taxonomy).

JOHN M. COULTER.

**Bot'any Bay,** a harbor in New South Wales, on the east coast of Australia, five miles south of Sydney. It was discovered by Captain Cook in 1770, and named from the large number of beautiful flowers and shrubs in its vicinity, though in other respects it is rather barren. In 1787 it received England's first penal colony in the east, and although the colony was removed the next year to Port Jackson, yet Botany Bay long continued to be the popular name, not only for this colony, but for all convict settlements. The spot where Captain Cook first landed is now marked by a monument.

**Botha, Louis,** Dutch burgher general in the Boer War with England (1899–1902), was a native of Natal, where he was born about the year 1861. In the war he defended the line of the Tugela River against Sir Redvers Buller, recaptured Spion Kop, and on the death of Joubert succeeded him as commandant-general of the Boer army. He has the reputation of being an able and attractive man, instinctively humane and even peace-loving and an ideal soldier.

**Both'nia, Gulf of,** the northern part of the Baltic Sea, between Finland on the east and Sweden and Lapland on the north and west. Its greatest length is about 450 miles, its average width 100 miles, and its depth from 120 to 300 feet. Along its shores as well as out in the gulf are

numerous small islands, sand banks, rocks and cliffs called *skoers*, which make navigation difficult. It has, however, many good harbors, and timber is exported from several ports. A large number of rivers pour their waters into the gulf, and the alluvial deposit from these is causing the land in the upper part to extend, while that in the lower part is slowly sinking. The dwellers along the shore are engaged in the herring trade. In winter the gulf is usually frozen so hard that it can be crossed by sledges. The water is but slightly salt.

**Bothwell.** See MARY, QUEEN OF SCOTS, and STUART.

**Botticelli,** (*bŏt'tē-chĕl'lē*) **Alessandro Filipepi,** known as Sandro Botticelli, the latter name being added by his companions after his oldest brother, was born at Florence, 1447, the youngest of five sons of Mariano Filipepi, a tanner. He loathed the drudgery of schools and gave little attention to his studies except those in which he was heartily interested. Learning this, his father apprenticed him to a goldsmith. In that day the goldsmiths were artists and closely associated with the painters. Young Sandro longed to paint and soon abandoned his trade, after the usual struggle with his parents, who desired a trade in preference to an art, and entered the atelier or studio of Fra Filippo Lippi.

Botticelli being a very sensitive youth was easily influenced and in his early work we find the influence of his first master. Being of a serious nature, he soon lost sympathy with Lippi's way of working and his painting shows the bolder style of Verrochio. When he was called upon to make one of a set of six panels whose subject was the virtues, for the Mercanzia in Florence, he easily adapted himself to the style of the brothers Pollaiuolo, who painted the other five. This was his famous *Fortitude*, his first important work. But Botticelli soon developed an individual style which is most evident in his Madonnas. In these he asserts his greater self, and we have all the charm and sympathetic feeling of the real Botticelli. He painted the spirit and not the material; his work was never personal but general; never the individual but the type and the type always the ideal.

In 1481 he was commissioned by Sixtus IV to assist in the decoration of the Sistine Chapel at Rome. Here he painted three magnificent frescoes of glorious conception. He rarely signed his paintings, which makes it difficult to place them in chronological order, but his style makes it easy to distinguish his work, though some of his students in copying it did it so well that their paintings have passed for his.

Lorenzo dei Medici, the great patron of art, invited Botticelli to join the circle of artists that formed his court, a great honor to be bestowed upon a painter, for Lorenzo was a competent judge. It was under his patronage that Botticelli painted most of his great canvases of mythological and historical subjects. Among them are *Pallas Subduing a Centaur, Venus among the Graces* and *the Birth of Venus. The Coronation of the Virgin* at the Florentine Academy and the *Adoration of the Magi* are two of his largest and best works, in which appear the portraits of the Medici princes and their retinues. But Savonarola and his wave of religious reform swept the country, and Sandro fell under his influence, after which he painted little, but these paintings were masterpieces with a deeper religious significance. He illustrated Boccaccio and made eighty-eight drawings for Dante's *Divine Comedy* and eight for the *Inferno*. The latter were engraved by Baccio Baldini and printed in Florence in 1481. Botticelli died in May 1510, alone and in poverty. His great influence on modern painting is shown in the work of the Pre-Raphaelites. See Jameson: *Italian Painters.*

**Boucicault** (*boo'sē-kō'*), **Dion,** British actor and playwright, was born at Dublin, Dec. 26, 1822, and died at New York, Sept. 18, 1890. He was educated at London University, and in 1841 he brought out, with the assistance of an actor, John Brougham, the play entitled *London Assurance.* In 1853 he came to the United States, and for the next seven years followed the stage as a profession, making a hit especially by his Irish play, *Colleen Bawn*, which had great success on the English as well as on the Irish stage. His other favorite productions include *The Corsican Brothers, The Shaughraun, The Octoroon, Arrah-na-Pogue* and a dramatic version of Charles Reade's story *Foul Play.* As an actor he excelled in the delineation of Irish character.

**Boudinot** (*bōō'dē-nŏt*), **Elias,** American statesman and philanthropist, and a patriot of the War of the Revolution, was born at Philadelphia, May 2, 1740, and died at Burlington, N. J., Oct. 24, 1821. In 1777 he became a member of the continental Congress, and in 1782 was its president, in which capacity, in the following year, he signed the treaty of peace with Britain. From 1795 to 1805 he was director of the United States mint at Philadelphia. In 1813 he was one of the founders of the American Bible Society, and from 1816 to 1821 was its president. He gave much of his means to charity, and wrote a reply to Thomas Paine's *Age of Reason*, entitled *The Age of Revelation.*

**Bouguereau** (*bōōg'rō'*), **Adolphe Wm.,** a distinguished French painter and member of the French Institute, was born at La

Rochelle, Nov. 30, 1815. A student at the École des Beaux Arts, he won the grand *prix de Rome*, in 1850, with his picture of *Zenobia on the Banks of the Araxes*. His other canvases include *Philomela and Procne; The Bather; Harvest Time; The Scourging of Our Lord; The Virgin with the Angels; The Youth of Bacchus; Psyche and Love*, etc., together with many fine frescoes, mural paintings and decorative work executed for the interiors of public buildings in France. Bouguereau died in 1905.

**Boulanger** (*bōō'lăn'zhā'*), **George Ernest Jean Marie.** Born in 1837 and died in 1891. He was a French general who rose to the position of Minister of War (1886–1887). He became very popular in France, and his popularity turned his head. He disobeyed the commands of his superior officers, and became involved in royalist plots to overturn the republican form of government. He was removed from his command, and thereupon he withdrew from France and finally committed suicide. He was one of the officers who represented the French government at the centennial celebration of the battle of Yorktown in 1881.

**Boulogne** (*bōō-lōn'*), a town of France, in the department of the Seine, on the right bank of the river of that name; population, 57,027. It has numerous villas and over 400 wash-houses on the river, which is here crossed by a fine stone bridge of twelve arches. Paris is five miles southwest of the town, and separated from it by the famous Bois-de-Boulogne, a fine park crossed by many drives and paths. Here the fashionable world of Paris may be seen in the afternoons, and on the broadest of the walks in Easter week they travel to the Abbey of Longchamp. At the entrance of the park or wood lies Auteuil, famous as the residence of many literary men. Many of the trees were cut down during the Revolution, and some injuries were done during the siege of 1870–71; but all traces of these have since disappeared.

**Bour'bon** (*bōōr'bŭn*), a French family which for several generations occupied the thrones of France and Naples, and which still rules in Spain. It derived its name from the castle and state of Bourbon in the center of France. It dates back to the 10th century. The first French king among the members of this family was the famous Henry of Navarre, who became Henry IV in 1589, and whose descendants reigned until 1792 and again, after the downfall of Napoleon, from 1815 to 1848. The house of Orleans is a branch of this family, through Philip of Orleans, brother of Louis XIV. The present Louis Philippe, Duc d' Orleans, 1869, son of the late Count of Paris, an Orleanist, is the acknowledged head of the French house of Bourbon. The Spanish branch of the house of Bourbon was founded by Philip, Duke of Anjou, who was placed on the throne of Spain in 1700. This dynasty reigned until Queen Isabella was dethroned in 1868, but it regained the crown in 1875. Through the same Duke of Anjou was founded the Neapolitan branch, which ruled in Naples until it became a part of the kingdom of Italy in 1860. Another branch ruled in Parma and Piacenza most of the time from 1748, until they also became part of the Italian kingdom. (The important members of this family will be found mentioned in separate articles. See also FRANCE, SPAIN, NAPLES and PARMA.)

**Bour'bon, Charles,** duke of Bourbonnais, called Constable de Bourbon, was born in 1490, and died at Rome in 1527. His great ability, bravery and large possessions soon made him the first subject in France. For his exploits at the famous battle of Marignano in 1515, called the battle of the giants, he was made constable of France and governor of Milan. But at the French court he had many enemies, who undermined him in the favor of the king, Francis I. He made an alliance with Charles V of Spain and Henry VIII of England, and fled in disguise from France. He gathered round him a body of German soldiers, who became devoted to him. Fighting against his own country, he took part in the great battle of Pavia, in which Francis I was prisoner by the Spaniards. Bourbon was made Duke of Milan and commander of the Spanish army in northern Italy, and was one of the army that plundered Rome in 1527, where he was killed. Seizing a scaling ladder, in order to make his way over a weak place in the walls, he was rushing on at the head of his troops, when he was mortally wounded by a bullet, probably shot, it is said, by the great Italian artist, Benvenuto Cellini. His soldiers carried his corpse to Gaeta, and buried it under a magnificent monument, which has since been destroyed.

**Bourget** (*bōōr'zhā'*), **Paul,** French poet and novelist of the psychological school and member of the French Academy, was born at Amiens, Sept. 2, 1852. In 1873, when he had finished his education, he first showed his gifts as a critic, in an article contributed to the *Revue des Deux Mondes*, followed by a collection of poems. In this volume and in the later effusion of his verse as well as in his prose *Studies*, he showed the characteristics of his style and thought. His works are eminently realistic and analytical, and chiefly consist of studies of the scientific and pessimistic tendencies of the age. The following works from Bourget's pen have been translated: *Cosmopolis; Pastels of Men; Antigone and Other Portraits of Women; Domestic Dramas: Outer-Mer;* and *Impressions of America.*

**Bourinot** (*bōō'rĭ-nō'*), **John George.** He held honorary degrees from several universities, was president of the Royal Society of Canada in 1892, and member of Council of American Historical Association and of the American Academy of Political Science. He is favorably known as the author of *Parliamentary Procedure*, of a *Manual of the Constitutional History of Canada;* of *How Canada is Governed; History of Canada* (in the Story of the Nations series); and *Canada under British Rule*, 1760–1900 (with maps). He was a contributor to leading reviews and journals such as *The Quarterly Review*, *Johns Hopkins University Political Studies*, *Blackwood* and the *Magazine of American History*. Born in 1837, his death occurred in 1902.

**Bout'well, George Sewall,** American financier and statesman, was born at Brookline, Mass., Jan. 28, 1818. After studying law he was for a number of years member of the Massachusetts state legislature, and in 1852–53 was governor of the state. He took part, later on, in the organization of the Republican party, and was a delegate to the Chicago convention that nominated Lincoln for the presidency. In 1862 he organized the internal revenue department of the United States, and was its first commissioner. During the years 1863–69 he represented his state in congress and was secretary of the treasury in Grant's cabinet. From 1873 to 1877 he was a member of the United States senate. He is the author of a number of works on educational topics and of a volume of speeches and papers, political and economical. He died Feb. 27, 1905.

**Bowdoin** (*bō'd'n*) **College,** an institution of learning, situated at Brunswick, Maine, of which Longfellow, Hawthorne, Chief-Justice Fuller and Speaker T. B. Reed were graduates. It received its charter in 1794, and was opened in 1802. Besides its art department, it has a medical school in affiliation with it, and is well equipped with library, gallery of paintings and chemical and philosophical apparatus. Its present president is Wm. DeWitt Hyde, D.D. The institution is undenominational.

**Bowdoin, James** (1727–1790), one of the early governors of Massachusetts, noted for his suppression of Shay's rebellion, and with his son (minister to Spain in 1804–08) as a benefactor of Bowdoin College.

**Bowell, Hon. Sir MacKenzie,** premier of Canada from Dec. 1894 to April, 1896, when he was succeeded by Sir Chas. Tupper. Born in England in 1823, he came to Canada when 9 years old, and became a printer's apprentice in 1834. Connected with the press for half a century, he was elected to the House of Commons in 1867 and remained a member continuously until 1892, when he was appointed to the Senate. He became a member of the Abbott administration in 1892 and of the Thompson administration in 1893. As minister of trade and commerce he visited Australia in 1893 with the object of creating trade between Canada and Australia. He was chairman of the colonial conference in 1894.

**Bowen** (*bō'ĕn*), **Francis,** an eminent American writer on political economy and moral philosophy, was born at Charlestown, Mass., Sept. 8, 1811, and died at Cambridge, Mass., Jan. 21, 1900. After graduating at Harvard in 1833, he subsequently held there the chair of political economy. From 1843 to 1854 he owned and edited the *North American Review*, and was one of its chief contributors. In 1853 he became Alford professor of natural religion, moral philosophy and civil polity in Harvard University. His writings embrace *Critical Essays on Speculative Philosophy; Moral Philosophy; Political Economy;* Lives of *James Otis* and *Baron Steuben*, contributed to Sparks's *American Biography;* together with *Gleanings from a Literary Life*.

**Bowls and Bowling.** Bowls is an outdoor game, largely played from an early period in Scotland, as well as in this country from colonial times on a flat and smooth piece of turf. Bowling is a kindred game, sometimes called skittles or ten-pins, played on a boarded alleyway (generally about 42 by 72 feet in extent). Lawn bowls is played on a piece of level turf, about 40 yards square, divided into numbered rinks, the players (2, 3 or 4 on either side) playing off a mat at the starting point, each with two lignum vitae bowls. The object played at is a distant smaller white porcelain ball —the game being to place the bowls as close to it as possible. The bowls (commonly 3½ lbs. each in weight) are made weighted slightly on one side, so that the player may reach the jack with his bowl by a curved rather than by a straight course roll. Alley-way bowling is played with balls not over 27 inches in circumference, each weighing about 15 lbs. These are played from one end of the court, with a preliminary run of 12 or 15 feet by the player, against a series of upright pins, ten in number and 15 inches in height, placed at the far end of the alley-way or court. The pins are set up in pyramidal form, 12 inches apart, the head pin being in the forefront of the series, so that when hit by a bowl the player has a chance of knocking down some and, if lucky, all of the pins. The game is usually an exciting as well as a healthful one, and matches frequently attract many onlookers. The American Bowling Congress has periodic national tournaments at which skillful playing may be seen.

**Bowling Green, Ky.,** a city, the seat of Warren County, at the head of navigation on Big Barren River and on the Louisville & Nashville Railroad, about 115 miles south-

west of Louisville. It lies in a fertile agricultural section of the state, raising largely corn, hay, oats, wheat and tobacco, and is a noted center for horse sales and trading. Among its farm stock are also mules and hogs. Settled early in the past century and incorporated in 1812, it has considerable of history, especially during the Civil War era, when it was deemed by the Confederates a place of strategic importance. It is governed, under a charter dating from 1893, by a mayor and city council, the city owning and operating its own waterworks and electric light plant. It has two fine public parks, besides several manufactures, including besides its flour mills, tobacco factories and carriage works. It is the seat of the Ogden School for boys, of St. Columba's Academy and the Western Kentucky Normal School, in addition to its own fine public school system. The population is 9,173.

**Boxer Rising at Pekin.** An anti-foreign uprising which began in the province of Chili (*chĕ-lē'*), China, in May, 1900, and lasted until the middle of the following August. The leaders were fanatics known as "Boxers" from the final syllable of the Chinese name which they gave themselves. Among their leaders were Prince Tuan, father of the heir apparent, and the uprising is believed to have been aided, or at least connived at, by the Dowager Empress and the Chinese court. Baron Von Kettler, the German Minister, and the Japanese Chancellor of the Legation at Pekin, were murdered during a two months' siege of that city by the rebels, whose attacks were directed against the foreign legations. A number of marines were landed from the vessels of foreign nations and a large international force was organized, which broke through the walls of Pekin on August 14 and released the besieged. As a result, China was obliged to execute a number of prominent Chinese known to have taken part in the uprising and to pay an indemnity of $300,000,000.

**Boy Scouts.** An organization of boys for physical, mental and moral development and helpfulness to others, which has reached world wide proportions and has many hundreds of thousands of members. While the name "Boy Scouts" was first applied to an organization formed in England by General Baden-Powell, the General acknowledged his indebtedness for the idea to the work of Ernest Thompson-Seton, Dan Beard and others in this country who, through various organizations, had been interesting boys in high ideals and practical service. The movement is non-military, and its purpose is summed up in the twelve points of Scout law, which require boys to be "trustworthy, loyal, helpful, friendly, courteous, kind, obedient, cheerful, thrifty, brave, clean, reverent toward God and to respect the convictions of others in matters of custom and belief." A uniform of khaki is usually worn, but is not required. Each local organization is called a "troop" and this, in turn, is composed of patrols. Each patrol has a name such as "otters" or "wild cats" with a patrol call by which members can communicate with each other at night or when in hiding. Boys between 12 and 18 are eligible to membership.

The plan and practical conduct of the organization by its leaders shows a profound knowledge of boy nature. It develops the boy in every direction and works hand in hand with the best ideals and most practical aspects of the modern public school. It is essentially based on the principle of "interest" (*q. v.*) which was emphasized by the great educational leaders, Herbart, Froebel and Rousseau. Merit badges are awarded for excellence in more then fifty different lines of study and practice qualifying boys for success in various businesses and professions.

Among the countries in which the movement has established itself are Germany, France, Italy, Australia, New Zealand, Canada and the South American Republics. Everywhere it has shown ready adaptation to new fields and nationalities. In Germany the boys have engaged in the work in such numbers and with such enthusiasm that the Prussian and Bavarian authorities are giving the movement financial aid. The total number enrolled is estimated at 2,000,000. The membership is largest in the United States where eminent citizens from all walks of public life are members of the National Council and of the Local Councils.

In the formation and conduct of local organizations, the scouts work with the local schools, churches and other organizations having a similar purpose. One of the best features of the movement is the strong physical, mental and moral guidance it gives to the boy through his association with adult leaders—the Scout Masters—a guidance which developes character and manhood.

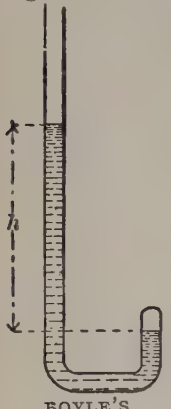
**Boycotting,** a term coined from Captain Boycott, an Irish land agent, to denote a system of organized social and commercial ostracism, familiar in its methods in Ireland, in connection with the land-league and with measures seeking to nationalize the land. The term has since had a wider application, where it represents a combination of persons or political parties, or a concerted action taken by such, to restrain from or prevent business dealings or social relations with another.

**Boyesen** (*boi'e-sen*), **Hjalmar Hjorth,** a Norwegian poet, novelist and critic, long a resident of the United States, was born in Norway, in 1848, and died at New York, Oct. 4, 1895. After graduating at the University of Christiania, he came to America in 1869, and for a time edited a Scandinavian journal in Chicago, and began to write fiction and verse, in English for the magazines. From 1874 to 1880 he taught

German at Cornell University, and then accepted the chair of Germanic languages and literature at Columbia College, a post which he held until his death. Among his chief works are *A Norseman's Pilgrimage; Gunnar, a Norse Romance; Goethe and Schiller, their Lives and Works; Essays on German Literature;* and a *Commentary on the Writings of Henrik Ibsen.*

HJALMAR HJORTH BOYESEN

**Boyle's Law** is an answer to the following question: "Just how does the volume of a given mass of gas vary when the pressure is varied and the temperature held constant?" This query was first definitely answered by Robert Boyle, a distinguished English physicist, in his essay on *A Defense of the Doctrine Touching the Spring and Weight of the Air*, published at London in 1772.



BOYLE'S EXPERIMENT

He inclosed a definite mass of air in the closed arm of a U-tube, as shown in the figure. He varied the volume, V, of this inclosed gas by pouring in more and more mercury; and measured the pressures, P, corresponding. In this way Boyle found that so long as the mass and temperature remain constant, the product of the pressure by the volume is a constant. This fact is known as Boyle's law, and may be expressed algebraically as follows:

$PV = \overline{K}$

where K = a constant.

**Boyne,** a river of Ireland, emptying into the Irish Channel after a course of about 80 miles. It has been called the Boyne of Science, because of the many institutions along its banks. It is celebrated for its scenery no less than for its historical associations. On its banks was fought, July 1, 1690, the famous battle of the Boyne, in which William III utterly routed James II. An obelisk, 150 feet in height, marks the scene of the battle.

**Bozzaris** (*bŏt'sà-rēs* or *bŏz-zăr'ĭs*), **Marco,** a Greek patriot, was born about 1788, at Suli, in the mountains of Epirus. His whole life was spent amid the din of battle. Driven from Suli, he united with a number of other refugees in the Ionian Islands against Turkey, and entered first the French service. In 1820 Ali Pasha, an Albanian, took arms against Turkey, and Bozzaris, with several hundred followers, joined him and won several victories. After the death of Ali Pasha, Bozzaris carried on the war for a while successfully. Later he became a general in the Greek army. When this army withdrew to Missolonghi, Bozzaris skillfully defended the place. In 1823 a Turkish army of 13,000 marched against the Greeks, and Bozzaris led 1,200 men to meet it. On August 20 he came upon the camp of the vanguard of the enemy, 4,000 strong. At night, leading 350 men, he burst upon his startled foes, and routed them with great slaughter. Bozzaris was killed while leading his men to the final attack, in Aug., 1823. The story of this heroic fight has been told by Fitz-Greene Halleck, in his poem, *Marco Bozzaris.*

**Brabant** (*brā'bant*), a district in the lowlands of Holland and Belgium, and now forming parts of these two kingdoms. In the course of its history it has had many masters. In 1814, by the treaty of Paris, it became a part of the Netherlands, and was divided in 1830 into the provinces of North Brabant, South Brabant and Antwerp. The Belgian revolution, in 1830 left North Brabant with the Netherlands, while the other two parts fell to Belgium. North Brabant (area, 1,980 square miles), with 'sHertogenbosch as its capital is a little larger than Rhode Island, and has a population of 597,538 South Brabant, somewhat smaller in size (area, 1,268 square miles), has over one and a quarter million people, speaking Flemish, and is one of the most densely inhabited countries in Europe. It is highly cultivated, and has important manufactures. Its capital is Brussels. Brabant or Brussels lace is well known. See ANTWERP.

**Brace, Charles Loring,** an American author and traveler, noted for his benevolent labors, was born at Litchfield, Conn., in 1826, and died in the Tyrol, Switzerland, Aug. 11, 1890. He worked among the lowest classes in New York, and was the founder of the Children's Aid Society in 1853, which has provided country homes for over 60,000 children. He traveled considerably in Europe, studying especially reform schools and prisons. He published several volumes of *Travels, Short Sermons for Newsboys* and a work on *The Dangerous Classes of New York.*

**Bract,** a general name applied to leaves, usually much reduced, which occur in a flower cluster. The word is somewhat extended in application by calling any reduced leaf-like body bract-like. For example, the sepals of a flower are often spoken of as bract-like.

**Braddock, General Edward,** a British soldier, major-general commanding the English army in the expedition against the French on the Ohio in 1755, was born in Perthshire, Scotland, in 1695, and died from wounds received in an ambuscade of French and Indians, at Great Meadows, in July, 1755, sixty miles from Fort Duquesne (now Pittsburg). On this expedition Braddock was accompanied by a levy of Virginians under Colonel (afterward General) Gates and Washington was his aid-de-camp, who, after the rout of the British, covered the retreat.

**Braddock, Pa.,** a thriving manufacturing town in southwestern Pennsylvania, on the right bank of the Monongahela, ten miles southeast of Pittsburg. It is noted as the site of the disastrous battle, under General Braddock (July 9, 1755), between the English and colonial levies and the French and Indians. Its industries include steel rail, wire, cement, plaster and railroad car manufacture. Population, 19,357.

**Brad'ford,** an important English manufacturing town in Yorkshire. It sends three members to Parliament. It is the chief seat in England of the manufacture of worsted yarn. It has now over 300 mills. Fine buildings, monuments and parks are abundant, and it is the seat of Airedale College. The first English temperance society was formed here. Population, about 290,000.

**Brad'ford, Pa.,** a city in McKean County on several railroads, near the southern boundary of New York and 70 miles south of Buffalo. It is in the heart of the oil and natural-gas region. Has extensive manufacturies, oil well supplies, machine shops, tile and terra cotta works, chemical works, three national banks, three daily papers, large hospital, libraries. Population, 14,544.

**Brad'ford, William,** one of the Pilgrims, was born in England, in 1590. In the cause of religious liberty he went to Holland. Here he joined the English congregation at Leyden, and sailed for America in the *Mayflower* (1620). The next year he was elected governor of Plymouth colony, and, with the exception of five years when he refused re-election, he held that office for thirty-one years, till his death in 1657. He wrote a history of the colony from 1620 to 1647.

**Bradley, Joseph P.,** was born at Berne, N. Y., in 1813. He practiced law in Newark, N. J. In 1870, he was appointed an associate justice of the supreme court by President Grant. He was circuit judge for the southern states, but in 1880 was assigned to the third circuit. He died in 1892.

**Bragan'za, House of,** the name of the ruling dynasty of Portugal and of the recent imperial family of Brazil. The family takes its name from the town of Braganza, and came to the throne of Portugal in 1640, through John IV, Duke of Braganza, who threw off the yoke of Spain. The first emperor of Brazil was Dom Pedro I, the eldest son of King John VI. He was crowned in 1822. His son, Dom Pedro II, was driven from the country and a republic formed in 1889. The reigning king of Portugal to-day, Manuel II, is of the house of Braganza-Coburg.

**Bragg, Braxton,** a Confederate general, was born in North Carolina, in 1817. A graduate of West Point, he served in the Mexican War, and was promoted several times for gallant conduct. He held several important commands in the Confederate army during the Civil War, and after the battle of Shiloh was placed in command of the Army of the Mississippi. He defeated General Rosecrans at Chickamauga, but was in turn defeated by General Grant at Chattanooga. For a time he acted as military adviser to President Davis. He died in 1876.

**Bragg, Edward Stuyvesant,** ex-congressman and brigadier-general commanding the "Iron Brigade" in the Civil War, was born in New York state, Feb. 20, 1827, and for a time practiced law at Fond du Lac, Wis. In May, 1861, he entered the Union army, and through hard fighting won promotion to the rank of brigadier-general. From 1877 to 1885 he was a member of Congress, member of the Democratic national convention of 1872, '84, '92 and '96, and in 1884 he seconded Cleveland's nomination for the presidency. In 1902 he became U. S. consul-general to Cuba, and later to Hong-Kong. Died June 20, 1912.

**Brahe** (*brā* or *brä*), **Tycho,** an illustrious Danish astonomer, distinguished above all else for his observations and for the invention of various astronomical instruments. Bessel has called him *König unter den Astronomen,* "king of astronomers." He was born at Knudstrup, near Helsingborg, on the island of Schonen, Dec. 14, 1546, and died at Prague, Oct. 24, 1601. He was educated partly at the University of Copenhagen, whither he went in 1559, and partly at Leipsic. The aggressiveness which characterized his entire life is illustrated by the fact that at the age of twenty he found himself in a quarrel which later led to a duel that cost him a part of his nose. His tastes led him quite as strongly in the direction of chemistry—or pyronomy, as he called this science—as in the direction of astronomy.

The remarkably brilliant new star which made its appearance on Nov. 11, 1572, seems to have had some influence in giving bent to his energies, although he had always been keenly interested in astronomy; for

while yet a lad he had saved enough pocket money to purchase a copy of Ptolemy's works, published at Basel in 1551.

At the age of 37, Brahe was placed in possession of a superb astronomical observatory, which had been built for him by King Frederick II of Denmark on the island Hven. Besides two towers 75 feet high, this observatory included a library, a residence, a chemical laboratory, a mechanical workshop, a printing office, a paper mill and the necessary farm buildings. To the entire outfit he gave the name of Uranienborg. Here he spent seventeen years in active observation. This observatory was completely destroyed in 1652. A change of rulers in Denmark brought disaster to Brahe and caused him to remove to Prague, where he was again established in a good observatory by Kaiser Rudolph II, and was assisted by his distinguished pupil, John Kepler.

To Brahe we owe the method of determining latitude by measuring the upper and lower culmination of a star, a vastly more accurate method than that used by Copernicus, viz., observations on the sun in meridian

We owe to him also a star map and the discovery of several new features in the moon's motion.

Brahe was not, as has sometimes been reported, an opponent of the Copernican system; but he saw that the ideas of Copernicus needed modification before they could be made to fit the then present state of knowledge. In estimating his work we must remember that it was all done before the invention of the telescope, before Kepler's laws were discovered, and before any physical connection (which we now call gravitation) between the sun and planets was dreamed of, much less studied and accurately described, as was done later by Newton.

**Brahma and Brahmanism.** See INDIA.

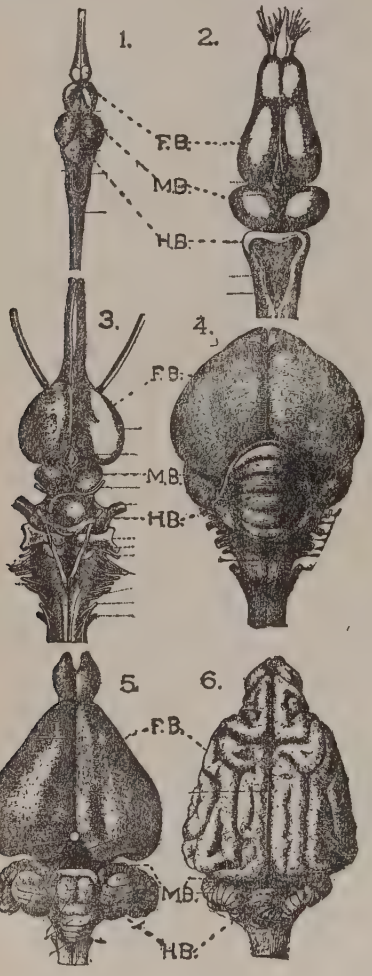
**Brahmaputra** (*brä'mȧ-pōō'trȧ*), meaning "son of Brahma," one of the largest rivers of India, rises in Tibet. After a course of probably 1,800 miles, together with the Ganges, it empties into the Bay of Bengal, through a vast delta. During the rainy season it floods an area of hundreds of quare miles, and makes fertile vast plains, which yield an abundance of rice, jute and mustard. Boats can ply upon its waters for 800 miles, and a vast traffic is carried both up and down the river. Europeans became acquainted with the river in 1765.

**Brahms** (*brämz*), **Johannes,** a notable German pianist and composer, was born at Hamburg, in 1833, and died at Vienna, April 3, 1897. His musical compositions are chiefly orchestral, though to the educated lover of music his choral compositions take by far the higher place. He has been styled the modern Beethoven, and by others is deemed the great rival of Wagner. He is more popularly known, however, by his many songs, ballads and choruses.

**Brain,** the seat of mental life and voluntary action. It is therefore the most interesting organ of the body. The brain and spinal cord, taken together, are called the central nervous system, for they form a sort of central axis, from which nerves pass to the various parts of the body and to which nerves lead from the surface. The brain of the higher animals is so much changed by growth and development that it is very difficult to understand. It has undergone so many changes in the course of evolution, that we must examine the brains of the simpler vertebrates in order to see what they were like before they became so modified. A glance at the accompanying sketches will tell more than words. It shows the general nature of the changes to be growth in size and complexity of the cerebral hemispheres, and we can see also that a series of brains merge by small changes into one another, so that the simplest and most complex are connected by intermediate forms.

The sketches represent the brains of various animals seen from above after removal from the cranium. In the brain of the perch (Fig. 1), the parts are all arranged in a row or line. The part marked *F. B.* is, in all the figures, that part of the fore-brain called cerebral lobes. In Fig. 1, they are smaller than the lobes of the mid-brain (*M. B.*). The latter are also called optic lobes. Behind these is a single lobe marked *H. B.*, which is the *cerebellum* or main part of the hind-brain. (The complete hind-brain embraces the *cerebellum* and the *medulla oblongata.*) In the frog (Fig. 2), the relative size of parts has changed. The cerebral lobes (*F. B.*) are now larger than those of the mid-brain. The lobes in front of the cerebral lobes are in all the sketches, the olfactory lobes, connected with the nerves of smell. The difference in size between the central lobes and those of the mid-brain, is more marked in the brain of the alligator (Fig. 3). In the pigeon (Fig. 4), the increase, relatively, in size of the cerebral lobes is much greater; they have expanded till they are now in contact with the cerebellum, and the lobes of the mid-brain are partly covered. The same line of modification is carried further in the brain of the rabbit (Fig. 5). Here the cerebral lobes are very large when compared with those of the mid-brain, and the cerebellum is ringed or divided into segments. Note, now, that the surface of the cerebral lobes is smooth in the rabbit and the bird, but in the dog (Fig. 6), we have a new development; the surface of the fore-brain is thrown into convolu-

tions. It is easy to go from this condition to that in the human brain, in which the cerebral lobes are so large that they cover the cerebellum. When the human brain is looked at directly from above, we can see only the cerebral lobes; all the other parts are covered, and the surface is much more convoluted than in the case of the dog's brain. Therefore, the line of change in brain,




1—BRAIN OF PERCH
2—BRAIN OF FROG
3—BRAIN OF ALLIGATOR
4—BRAIN OF PIGEON
5—BRAIN OF RABBIT
6—BRAIN OF DOG

from simpler to higher forms, has been the great expansion of the cerebral lobes, and there have also been internal changes.

The outer layer of the central lobes is called the cortex. It consists of gray matter which under the microscope is made up of an immense number of nerve-cells, arranged in layers. Nerve fibres lead away from the nerve-cells, and serve to carry the impulses that arise within the latter. Just as electricity generated in a battery cell may be carried away by wires, so the nervous energy that arises in the nerve-cell is carried away by the nerve fibre. The many fibres leaving the cortex serve to connect it with other parts of the brain, and also with the tissues of the body. Bundles of fibres form fibre-tracts, which pass into the spinal cord, and from which smaller bundles of fibres run in the nerve trunks and are distributed to muscles and all other tissues of the body. These are motor, secretory nerves, etc. Similar groups of fibres run in the opposite direction from the surface of the body inward. These are sensory fibres.

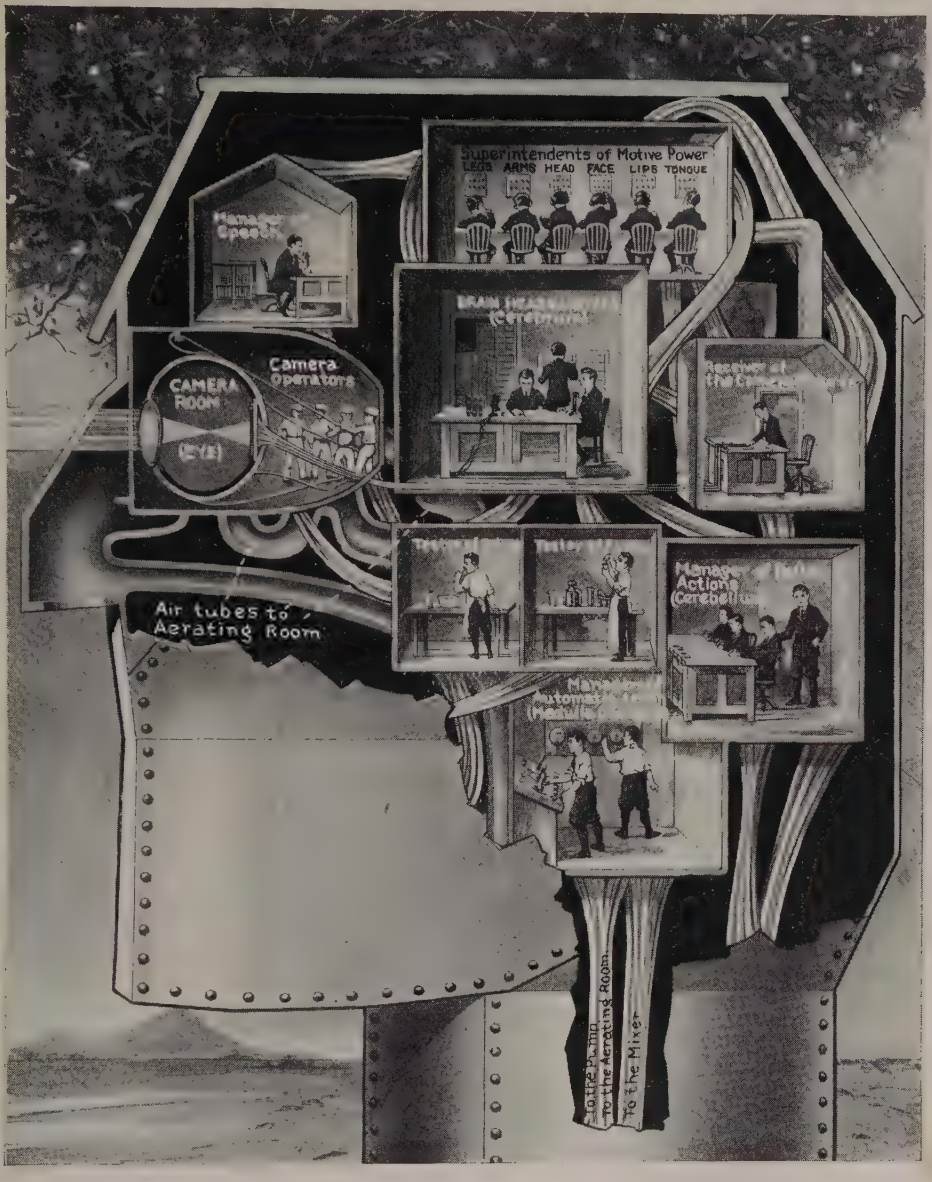
It is extremely interesting to know that certain groups of nerve-cells in the cortex preside over particular movements and particular activities of the body. The entire outer surface of the brain has been explored by use of the electrical current and divided into territories called areas. The stimulation of a particular area, for example, will cause movements of muscles of the leg (see sketch), that of an adjacent area, movements of the arm, etc. The diagram shows the parts of the cortex connected with the leg, arm, face, tongue, larynx, with hearing, sight, speech, word-blindness and sensation. Any disorder or deficiency in the cortex of these areas makes disturbances or disorders of the muscular movement, or the sensations connected with them.

The cerebellum, likewise, contains clusters of nerve-cells, which connect with fibres, and regulate a large number of muscular movements. The medulla oblongata contains clusters of cells called centers, which control and regulate breathing, action of the heart, swallowing, movements of the stomach, the blood supply to different parts, etc. Any injury to the medulla is, therefore, very serious.

Diagram of the human brain, showing area of the cortex

Some of the most interesting recent experiments show that the nerve-cells undergo changes, that can be detected by the microscope, similar to the changes in the cells of glands and other tissues, when they are active. This brings the activity of the central nervous system into line with that of other physiological processes.

# A LOOK INTO THE EXECUTIVE OFFICES


Superintendents of Motive Power
LEGS ARMS HEAD FACE LIPS TONGUE
CAMERA ROOM
Camera Operators
Air tubes to Aerating Room
Tube Piping to the Aerating Room
To the Mixer

Here we are in the executive offices of the mechanical man. Notice how the central office, the cerebrum, is connected with the offices of the various assistant managers. From the head office is supervised everything except the digestive and pumping departments, which are taken care of by the managers of automatic action. One of the most curious things about this mechanical man is that he looks, so to speak, with the back of his head. The pictures are taken through the eye, to be sure, but we do not know that we are seeing anything until the report reaches the office of the receiver. In a similar way the imaginary little people in the departments of taste and smell receive these sensations and like the pictures, they are placed on file; that is to say, we cannot only taste and see things at the time, but can remember how things taste and smell and how they look. The department of hearing could not be shown in this picture because it is just on the other side of the department of taste.

See Edinger: *Anatomy of the Central Nervous System*, etc. (1899); Ferrier: *Functions of the Brain;* and Barker: *The Central Nervous System* (1900). WM. A. LOCY.

**Brai'nerd, David,** one of the earliest missionaries to the American Indians, was born in Connecticut in 1718. He labored among the Indians of Massachusetts, Pennsylvania and New Jersey with much success. He died in 1747, while still a young man, at the house of Jonathan Edwards, who has written an account of his life.

**Brainerd, Minn.,** a city, the seat of Crow Wing Co., on the east or left bank of the Mississippi River, 136 miles northwest of Saint Paul and about 100 miles west of Duluth. It is on the Northern Pacific and the Brainerd & Northern Minnesota Railroad. Water power for its main industries is mainly from the Mississippi, and its chief manufactures comprise, besides the car-works and machine shops of the Northern Pacific R. R., lumber and flour mills, foundries, breweries and cigar factories. A United States signal station is located here, and the city has besides a public park and athletic grounds, a lumberman's hospital, court-house and the buildings of the Y. M. C. A. The city was chartered in 1883, and is governed by a mayor and city council. It has a population of 10,000.

**Brake** (car), a device for stopping a car. All practical brakes act by friction, blocks of metal called shoes being pressed against the rims of the wheels. They differ in the method of forcing these shoes against the wheels. The older method was by hand power, the force being transmitted from a wheel through a chain and system of levers, but as the speed of trains increased, quicker and more powerful brakes were required. For high speed trains, the brake must act practically at the same time on every wheel on the train, that is, it must be continuous, and also be capable of being controlled by the locomotive engineer, so that the train can be controlled quickly from one point. A point of safety is that the brakes must act automatically in case of accident, such as in case of the breaking of the connections of the train. Four kinds of power have been used for such continuous brakes: mechanical, hydraulic, electromagnetic and air. Air brakes have proven themselves to be so superior to all others that they are the only brakes having extensive use to-day. Air brakes are of two kinds: vacuum and compressed air brakes. The vacuum is produced by a form of injector placed on the locomotive, which partially exhausts cylinders or bellows placed under car. The atmospheric pressure then compresses the bellows or forces in the piston of the cylinder, and this acts on a mechanism which puts on or off the brakes. In some systems, as in the Saunder's vacuum brake, the brakes are on normally, and they are held off by the atmospheric pressure as long as the vacuum is maintained. In other brakes, exhausting the air throws on the brakes. The air brake used more extensively than any other is the Westinghouse quick-action automatic air-brake. This acts by compressed air produced by a compressor on the locomotive. The compressed air is stored in a tank on the tender of the locomotive, and from thence distributed by flexible connections and pipes to the brake cylinders placed under each car of the train. The action of this brake is quick and powerful. In its improved form, the action travels with a high velocity, so that with a train of fifty cars, having a length of 1,900 feet, the action takes place at the last car in $2\frac{1}{4}$ seconds after application at the first car. The theoretical velocity possible is that of the velocity of sound in air, and that would take $1\frac{3}{4}$ seconds to travel the 1,900 feet, so that the action of the automatic brakes is almost perfect.

**Branch'ing.** A branch is a repetition of the axis from which it springs. There are two prominent forms of branching. One is known as dichotomous, and is chiefly characteristic of the lower plants. It consists in the division of the apex of the axis into branches, usually two in number, as the name indicates. In cases of dichotomy, therefore, an axis stops where it branches. The other type is known as monopodial, and consists in giving off branches from the side of the axis, which itself continues to develop. This is the type more characteristic of the higher plants.

**Brandeis, Louis D.,** lawyer, was born in Louisville, Ky., November 13, 1856, admitted to the bar in 1878, and until his appointment as Associate Justice of the United States Supreme Court in 1916, practiced in Boston. Among the cases which brought him a national reputation was that of the advanced freight investigation before the Interstate Commerce Commission in 1911, in which he appeared for the shippers; suits relating to the constitutionality of laws limiting hours of labor for women, and in opposition to the New Haven monopoly of transportation in New England. He has written extensively on public franchises, wage earners' life insurance, the scientific management of labor problems, and other social economic subjects.

**Bran'denburg** (*brän'den-bŏorg*), a central province of Prussia, which formed the starting point of the present kingdom. Its area is 15,383 square miles, one and a half times the size of Maryland. The population is 4,092,616, largely Protestant. Brandenburg came into the possession of the Hohenzollerns, the present ruling family of Germany, in the 15th century. Later

it was joined to the duchy of Prussia, and in 1701 the Hohenzollerns became the kingly line of Prussia, and in 1871 the imperial family of Germany. Berlin is the capital of Brandenburg, as it is also of Prussia and of Germany. The town Brandenburg is on the River Havel, 35 miles west of Berlin. Population, 51,239.

**Brandes** (*brän'dēs*), **Georg Morris Cohen,** Danish literary critic and man of letters, was born at Copenhagen in 1842 and educated at its university. He and his brother Carl (a notable Danish dramatist) are of Jewish extraction. Prof. Brandes spent his early life in France and Germany, and published works entitled *Æsthetic Studies, Criticisms and Portraits* and *French Æsthetics in Our Day.* Returning to Denmark, he delivered lectures at the University of Copenhagen, which were published under the title of *Main Currents in the Literature of the 19th Century* This work, owing to its radical thought, made him enemies in Denmark and led to his settlement once more in Berlin. Later on there came from his pen a work on *The Danish Poets,* a clever piece of psychological analysis; *Impressions of Poland; Impressions of Russia; A Study of Ibsen;* Lives of *Ferdinand Lassalle* and *Benj. Disraeli; Men of the Modern Revival;* and *Wm. Shakespeare, the Man and His Works,* an elaborate study of the great poet.

**Brandon,** the second city in importance in the province of Manitoba. Population, exceeds 10,500, having doubled in five years. It is situated at the junction of the Little Saskatchewan and Assiniboine Rivers, 132 miles west of Winnipeg, and on the main line of Canadian Pacific Railway. It was founded in 1880, taking its name from the Brandon Hills situated about eight miles to the south. It is rapidly growing in commercial importance.

**Bran'dy** is the liquid obtained by distilling grape wine. It is generally made from white and red wines, and the different wines used give their peculiarities to the brandy. Wines which have the most alcohol yield the most brandy. The best brandy (Cognac) is made in the department of Charente, France, and is known as cognac and armagnac, from the names of the towns where it is manufactured. Catawba brandy, made from the Catawba wine of Ohio, is very good, as are the brandies made from the California grape. A liquor called brandy is sometimes made from the juice of other fruits besides the grape, known as peach brandy and cider brandy or apple-jack. Pure brandy consists almost entirely of alcohol and water. It has no color when fresh, but burnt sugar is usually added to give its wine-color.

**Bran'dywine,** the name of a creek in Pennsylvania, flowing southeast into Delaware, and emptying into Christiana creek at the city of Wilmington. It is known as the site of the battle of the Brandywine, which was fought on its banks, September 11, 1777. The Americans, 13,000 strong, under Washington, were defeated by a force of 18,000 British, under Lord Howe.

**Brant, Joseph,** a leader of an Indian tribe, friend and ally of the British, was born in 1742. His ancestors lived in the Mohawk Valley. The name of his foster father was Brant. He visited England in 1775 at a time when the Six Nations were hesitating as to whether they would join with the colonials or the British in the Revolutionary War, when he received much attention. On his return he energetically and bravely espoused the British cause, winning distinction for his valor. Brant was a humane Indian, and his admirers have warmly resented the statements contained in Campbell's *Gertrude of Wyoming,* in effect accusing the Indians of wanton cruelty. After the war the lands of the Six Nations passed into other hands, and they were given by way of compensation a strip six miles wide on each side of the Grand River (Ontario) from its mouth to the source. Some of them settled in the Bay of Quinté district in eastern Ontario. In 1785 there were 700 of the Six Nations settled in the County of Brant. Now there are 4,000. The old Mohawk church (Anglican), the first church erected in upper Canada, built in 1786, is on their reserves. His great-grandson was one of the speakers at the centennial U. E. Loyalists celebration held in Adolphustown (eastern Ontario), in 1884. Brant translated the Gospel of Mark and the English prayerbook into the Mohawk language. He died in 1807, and a monument, with a large bronze statue above it, has been raised at Brantford, Ontario, Canada, in his honor.

**Brant'ford.** City of 21,964, situated on the Grand River, 25 miles west of Hamilton, called after the Indian Joseph Brant, whose body is buried in the old Mohawk church, two miles from the city. It is the headquarters of the consolidated Six Nations. The noted inventor, Alexander Graham Bell, lived here for many years, and a handsome memorial has been erected in his honor. It is sometimes called the telephone city, and is favorably known as a manufacturing center. It is on the main line of the Grand Trunk Railway, served also by the Toronto, Hamilton & Buffalo Railway, less than two hours from Toronto. Public buildings, schools, and churches are very attractive.

**Brass,** an alloy of copper and zinc. It is made by several processes. The most common method is to melt the copper first and then put in the zinc. Brass is used in many ways in the arts, on account of its ease in working and its color. It is harder

than copper, but can be easily worked. It is readily cast, rolled, stamped and worked in various other ways. Different varieties are made by varying the proportions of the two metals. Ordinary brass contains about seventy parts of copper and thirty of zinc. Yellow metal contains more zinc. It is rolled into sheets and used for sheathing ships. Tombac, prince's metal, mosaic gold, etc. are among the numerous varieties. By adding tin, brass is made stronger; while lead makes it harder, so that it can be more readily worked in the lathe. Brass can be cleaned with nitric acid.

**Brassey, Lady Anne,** wife of Lord Thomas and a great traveler, accompanying her husband in his tours in the yacht *Sunbeam*, was born in 1840, and died at sea, Sept. 14, 1887. She is the author of the delightful *Voyage in the Sunbeam*, published in 1878; of a cruise to Cyprus and Constantinople, described in *Sunshine and Storm in the East;* and of a later work, *In the Trades, the Tropics and the Roaring Forties.*

**Brassey, Thomas, Lord,** an English political economist and authority on seamanship, was born in 1836 (the son of Thomas Brassey, the great contractor, whose *Life* was written by Sir Arthur Helps) and educated at Rugby and at Oxford. He entered English political life in 1865, and from 1880 to 1885 he was civil lord of the admiralty in Mr. Gladstone's administration and afterward secretary to the admiralty. Since 1895 he has been governor of Victoria, Australia. He is known as an enthusiastic yachtsman, interested in the British seamen, a writer on the British navy; and in 1893–95 was president of the Institute of Naval Architects. His chief writings are a treatise on *Works and Wages; The Eastern Question; English Work and Foreign Wages;* and *The British Navy* (in 5 volumes).

**Brattleboro, Vt.,** a town in Windham County, on the Connecticut River, about 60 miles north of Springfield, Mass., reached by the Central Vermont and the Boston and Maine Railroad. The town dates from the middle of the 18th century and has an interesting early history, while it occupies a picturesque site. Besides its civic buildings it has a public library and is the seat of the state asylum for the insane. Among its manufactures is the factory of the Estey parlor-organs; its other establishments are furniture and toy-making factories and those producing children's carriages, wagons and canning machinery. Maple-sugar is also a product of the industries of the town. Population (census 1910), 7,541.

**Brazil, Ind.,** a city, the seat of Clay County, 57 miles west southwest of Indianapolis and about 20 miles east of Terre Haute, on the Wabash River. It is reached by the Chicago & Eastern Illinois Railroad, the Evansville & Terre Haute system and other railroads. The city has a public library, and owns and operates its own water-works. Its industries, aided by the extensive deposits of block-coal, clay and shale of superior quality in the neighborhood, include sewer-pipe and other clay products, brick and tile works, the manufacture of pig iron, boilers, mining engines, steel rails and a variety of other machinery. Brazil dates from about the year 1856, and was incorporated as a city in 1878. Population, 10,315.

**Brazil, The United States of.** The largest state of South America and the third largest political division of the western continent. It has the Atlantic on the east and northeast, with a coast line of 5,000 miles. Its land frontier of 10,000 miles confronts all the other South American states except Chile. Its breadth is 2,705 miles, its length 2,660 miles, and its area 3,218,991 square miles. It is larger than the United States, excepting Alaska. It occupies nearly one half of the South American continent.

*Surface and Drainage.* Lying like a vast triangle in the eastern angle of the continent, Brazil falls naturally into two sections. The eastern and southern portions are high, containing two mountain ranges, with an enclosed elevated plateau. The northern and western section consists of plains and lowlands, including the valley of the Amazon.

Brazil's unique feature consists of the most remarkable system of water-ways on our planet. Three great river systems drain the country, the Amazon, the Plata and the San Francisco. The mighty Amazon alone, with its branches, drains fully one half of Brazil. The rainfall of the South American continent is heaviest in the interior on the head waters of the Amazon, so that this river is already a stream two miles wide and 150 feet deep where it first enters Brazilian territory, 2,300 miles from its mouth. With its tributaries it affords 27,000 miles of navigable water. The Madeira, the longest tributary, gives access to Bolivia. The Rio Negro, the largest northern affluent, connects with the Orinoco and thus furnishes navigation into Colombia and Venezuela. Another extensive and important system is the Paraguay and its branches, which terminate in the Plata. The San Francisco, which flows directly into the Atlantic, gives, with its tributaries, 4,400 miles of navigation.

*Transportation.* The great rivers above named give abundant access to the interior of the country, and this fact is the more important because large areas must otherwise remain inaccessible, being not adapted to the building of railways. Brazil has 14,000 miles of railways and these have been

confined largely to the seaboard sections, but are now being extended into the interior.

*Climate.* Nearly the whole of the area of Brazil lies within the tropics, less than ten per cent. being in the temperate zone. With the heavy rainfall, especially in the western portion, there is thus a combination of heat and moisture which results in rank growth of vegetation. In the extreme southern sections the four seasons are fairly marked; elsewhere they consist only of the wet and the dry season.

*Natural Resources.* Brazil is an agricultural country. Vegetation is rich and varied. The forests, especially in the Amazon valley, have an amazing growth, and abound in animals, birds and plants. The rivers are full of fish and reptiles. In the valley-region development of the country has been hindered by the almost uncontrollable luxuriance of vegetation, which the meager population has been unable to subdue and hold in check. Brazil has more varieties of plants than any other country in the world. Her forests have a great variety of valuable woods, including rosewood, mahogany, satinwood, oak, pine and many others.

Brazil furnishes more than 60% of the world's coffee and more than 50% of the world's rubber. Other important products are sugar, tobacco, cotton, rice, mate, cocoa and nuts. Among her fruits are pineapples, oranges, mangoes and grapes. In southern Brazil the cattle industry is important. The mineral resources of Brazil have not been largely developed, but there are deposits of coal and also gold, silver, lead, zinc, iron, copper and other minerals.

*Manufactures.* Manufactures are not largely developed, but are on the increase. There are more than a hundred cotton mills, also woolen factories, with silk mills, flour mills, etc.

*Government.* The United States of Brazil are a federal republic, the constitution being formed after the pattern of the United States. There are twenty states and one federal district. The national Congress consists of a senate and chamber of deputies.

*Inhabitants.* The population is about 22,000,000, less than half being of European descent. The language, unlike that of the rest of South America, is Portuguese. There are over 2,000,000 immigrants, chiefly Italian, Portuguese, Spanish and German. The religion is Roman Catholicism. The federal government pays the salary of the prelates, but has declared absolute freedom for every form of religion.

*Education.* Education is under state control, primary education being free but not compulsory. In Rio de Janeiro there are polytechnic schools, law schools, normal schools, a school of war, a college of marines and a naval academy. Other cities are provided with similar schools, but on the whole the standard of education is low, four out of five of the population being illiterate.

*History.* Brazil was discovered in 1500 by the explorer Pinzon, and thirty years later the Portuguese began to plant colonies along its coast. Their selfish and greedy policy long delayed the progress of the country. In 1808 the royal family of Portugal, the house of Braganza, being expelled by the French, took refuge in Brazil, and their stay was marked by great growth in the country. On their return the king's eldest son was left as prince regent, but soon afterward, in 1822, he declared Brazil independent, and was crowned emperor as Dom Pedro I. Worn out with the cares of rule, he abdicated in 1831, and for nine years regents guided the affairs of the empire, until in 1831 Dom Pedro II, at the age of 15, was crowned emperor. Except a few insurrections, his reign was peaceful, until the revolution in November, 1889, when the empire became a republic. The ex-emperor was kindly treated and provision made for his support, though for fear of trouble from his presence he was sent to Portugal. The capital of Brazil, its largest city and most important seaport, is Rio de Janeiro. Population (estimated), 1,000,000. The other chief towns are Bahia (230,000) and Pernambuco (150,000).

**Brazos** (*brä'zōs*), formerly called Brazos-de-Dios, is a large river in Texas. It rises in the elevated region of the northwest that once was called the *Llano Estacado* or Staked Plain, and flows southeastward between Colorado and Trinity Rivers. After a course of about nine hundred miles it falls into the Mexican Gulf, forty miles southwest of Galveston. During the wet season it affords 300 miles of steamboat navigation. The cotton plantations along the river are highly productive. About midway between the source and the mouth is Waco (population, 30,000). This is an important railway center and the chief city on the river.

**Bread,** an article of food. Wheat is the best material for making bread; but other grains are used, such as rye, barley, Indian corn and rice. The earliest bread was made without leaven or yeast, like the unleavened bread of the Jews and the oat cakes of Scotland and the corn cakes of America. Leaven was used to raise bread, that is, to give it a spongy texture, before yeast. It is simply a portion of moistened flour or dough which has begun to ferment, and so when added to the mass causes the rest to ferment. Leaven is still used, but yeast has very generally taken its place,

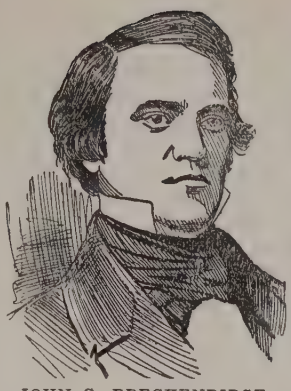
The usual materials of bread are flour, yeast and water containing salt. Many of the operations of breadmaking are now carried on by machinery. Some bakeries use 2,000 bags of flour in a week. Brown bread is made from the ground but undressed wheat, and so contains the bran as well as the wheat.

**Bread'fruit Tree,** a native of southern Asia, of the islands of the South Pacific and of the Indian Archipelago. It is now grown also in some of the West Indies. Growing to a height of forty or fifty feet, it has large, dark-green leaves and a sphere-shaped fruit, about the size of a child's head, weighing sometimes over four pounds. The fruit is the main food of the natives of the South Sea islands. It is covered with a rough rind, and the fruit when ripe is juicy and yellow. It is better, however, before it is fully ripe. When cut up and baked in an oven, it is mealy and nourishing. In taste somewhat sweetish, it is more like a plantain than ordinary wheat bread. When properly cooked, it will keep several weeks. The South Sea natives beat it into a paste, which, slightly fermented, is somewhat sour, but a food they relish. The breadfruit tree will produce two or three crops a year. The wood is used for furniture, for building and for various purposes.

BREADFRUIT

**Breakwater,** a bank or levee of stones or a timber structure, used to break the violence of the sea in its entrance into a harbor or roadstead. There may be a natural breakwater, as the Isle of Wight, which protects Portsmouth and Southampton. The Romans made artificial breakwaters of some size in several Italian ports. The first modern structure and the greatest of all breakwaters is that at Cherbourg, on the French side of the English Channel. There are also breakwaters in the English harbors of Plymouth, Portland and Holyhead. Several structures of this kind have also been built upon the Great Lakes, as at Buffalo and Cleveland on Lake Erie and at Chicago on Lake Michigan. The one at Buffalo is the largest in the United States. The usual method of building breakwaters is to cast down large stones and allow them to settle under the action of the tides and currents. The top is then covered with large blocks of artificial stone or with paving laid at a regular slope, and a wall is built.

**Breck'enridge, John Cabell,** an American politician and soldier, was born in Kentucky in 1821. He took part in the Mexican War, and afterward became a member of Congress. In 1856 he was elected vice-president, with Buchanan as president, and four years later was one of the Democratic candidates for president, receiving the electoral votes of most of the southern states. He was elected senator, but entered the Confederate army, where he rose to the rank of major-general. In 1865 he was appointed Confederate secretary of war. Later, he practiced law in Kentucky. He died in 1875.



JOHN C. BRECKENRIDGE

**Bremen** (*brĕm'en* or *brā'men*), one of the three free cities of Germany, stands on both banks of the Weser, which is spanned by four bridges. Though called a free city, it is really a little state, having an area of 99 square miles, which includes, besides the city itself, the port of Bremerhaven and several other small places. It goes back in history to the time of Charlemagne in the 8th century, was at one time a member of the so-called Hanseatic league of cities, and is now a part of the German empire. It has a senate of sixteen members and a council of 150 burgesses. It has a number of old and interesting buildings, but is especially noted for its large trade, in which it holds the second place among the cities of Germany. Its enormous foreign trade extends all over the world, but is largest with the United States. Its exports to the latter embrace aniline dyes, cotton hosiery, cotton lace, furs, hides, skins and leather manufactures, toys, rubber, woolen cloth, etc. From its port about fifty per cent. of all German emigrants set sail, most of them coming to the United States. In one year 52,000 emigrants left its port, and that same year it imported from the United States goods valued at almost $30,000,000. Twenty-five hundred vessels arrive yearly. It is the headquarters of the North German Lloyd steamship company, and is connected by rail with the whole of western and central Germany. Population of the state is 298,736 and that of the city 246,827.

**Bremer** (*brē'mĕr*), **Frederika,** a well-known Swedish novelist, was born in Finland in 1801, but was brought up near Stockholm, Sweden. She wrote verses as a child; and was well-educated, finishing her

studies in Paris. Her first and best novel, *The Neighbors*, was translated into German, French, Dutch, Russian and English, and gave her a wide fame. After writing several other stories, she traveled through many countries, writing descriptions of the people in her *Homes of the New World* and *Life in the Old World* and in many other works. She spent two years in the United States and was cordially received everywhere. The latter years of her life were largely given up to thought and work for women. She has been called the Jane Austen of Sweden. Among her best books are *The Diary*, *The President's Daughter* and *Brothers and Sisters*. She died in 1865.

**Breslau** (*brĕs'lou*), the capital of Prussian Silesia, lies at the junction of the Ohlau and the Oder, which divide the city into two parts joined by numerous bridges. The old parts of the city are somber and massive, but the new parts have many fine specimens of the architecture of today. It has a university, founded by Leopold I in 1702, which has a teaching force of 189 and 1920 students and a library of 400,000 volumes. It is important as a manufacturing and trading town, having fine railroad and river advantages. Linen fairs are held, and it is a great wool-market. In population it ranks sixth among German cities, numbering 511,891 people. Breslau has been occupied at different times by Poles and Bohemians. It passed into the hands of Austria, and finally into the hands of Prussia.

**Brest,** a French city in the department of Finistère, on the north side of the Bay of Brest. The bay is one of the finest harbors of Europe, and was long a bone of contention among European powers, and several naval battles have been fought in its neighborhood. Its fortifications, begun by Cardinal Richelieu in the 17th century, and the narrow and strongly protected throat which forms the entrance make it a formidable naval station Its industries are mainly connected with the equipment of the navy. A submarine cable gives it connection with America. A splendid iron swing-bridge crossing the little stream which flows through the city, a fine promenade along the shore and an old castle are among the interesting features of Brest. Its population is 90,540.

**Breton** (*brĕ-tōn'*), **Jules Adolphe,** a French painter, was born in 1827. He has become well-known as a painter of scenes from peasant life. Among his best works are *The Gleaners*, *Blessing the Grain*, *Evening*, *The Weeders* and *The Communicants*.

**Brewer, David Josiah,** associate justice of the Supreme Court of the United States, was born at Smyrna, Asia Minor, June 20, 1837, his father being then a missionary in the east. He was educated at the Wesleyan University, at Yale and at Albany Law School. He practiced law at Leavenworth, Kan., where he was elected probate judge. In 1870 he became associate justice of the supreme court of his state, resigning in 1884 to become judge of the United States Circuit Court. In 1889 he became associate justice of the United States Supreme Court, under appointment of President Harrison. He took an active interest in education while a resident of Kansas, and was a member of the faculty of the Columbian Law School. He is an LL.D. of Yale. He also acted on the Venezulean Commission appointed by President Cleveland, and was a member of the British Venezuelan Arbitration Tribunal. In 1891 he delivered an important address before the Yale Law School on *The Protection of Private Property against Public Attack*. He is the author of a work on *American Citizenship*. He died March 28, 1910.

**Brew'ing,** the art of making fermented drinks without distilling, is divided into two processes: first malting and, second, brewing properly so-called. In malting, the barley is first steeped in cold water for two or three days, so that it may absorb water, swell and soften. The barley is now spread on the floor of the malt-house to the depth of a foot or rather more. There it is left until it begins to throw out shoots and rootlets. The grain is frequently turned and carefully watched, and removed by degrees as it comes to the right stage. When this occurs, as it usually does in about twelve days, the grain is dried in a heated room called a kiln, and germination is of course checked. The barley has now become malt. A temperature of about 100° in the kiln gives pale malt; of 150°, brown malt, such as is used for porter and stout. What has been so far gained is that the substance of malt will dissolve, while barley will not. The next step is the brewing properly so-called. The malt is crushed between iron rollers. It is then called grist, and the grist has next to be mixed with hot water and set in mash-tubs to stand. Starch and glucose are sometimes added to adulterate the brew, so as to eke out the malt. The liquor is then carefully drawn off from that part of the grist which has not been dissolved. This liquor, now called wort, is allowed to stand for a few hours, and is then drawn off and boiled with hops in copper boilers. The hops give flavor to the beer and act as a mild stimulant or tonic. The boiled wort is fermented in large vessels or vats. The process of fermentation is started by adding to the wort about one per cent. of yeast, saved from a previous brew of the same kind of beer. The temperature rises, and after about a week the brew is put into cleansing vessels where the ferment is very slow. The yeast is drawn off; and the beer is left for some time in barrels to mature before use.

**Brews'ter, Sir David,** a noted Scottish natural philosopher and student of science, was born in 1781. He was for years editor of the *Edinburgh Encyclopædia*, and at the same time was engaged in scientific studies and in writing on kindred subjects. He was a member of a number of societies, was knighted, and received many medals for his discoveries in science. The last few years of his life were spent as principal of Edinburgh University. He died in 1868. His name is lastingly connected with the study of optics and the polarization of light. The beautiful and scientific toy called the kaleidoscope was invented by him, and he made many improvements in the stereoscope. He was also a fine writer, and has left behind him several works besides his articles in magazines and encyclopædias. *Letters on Natural Magic*, addressed to Sir Walter Scott; *More Worlds Than One; Martyrs of Science;* a *Life of Newton;* and *Tycho Brahe and Kepler* are among his most interesting books.

**Brews'ter, William** (1560–1644), one of the most notable of the Pilgrim Fathers who, in 1620, came to Plymouth, Mass., in the *Mayflower*, and was a ruling elder in the historic body. Born at Scrooby in Nottinghamshire, England, he for a time studied at Cambridge, and then attached himself to the Separatists or Nonconformists, who, to escape persecution, fled to Holland; and he taught at Leyden. With William Bradford, subsequently governor of Plymouth colony, he came to the New World and formed one of the first settlements of Pilgrims in New England, and until his death was a preacher in the community and a loyal and revered leader in the colony. See Steele's *Chief of the Pilgrims* and *Life of William Brewster.*

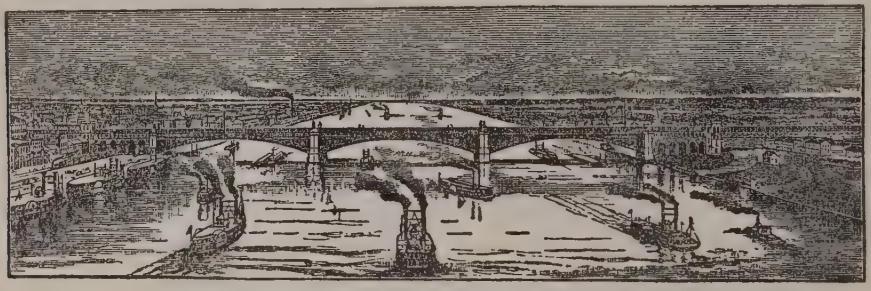
**Briareus** (*brī-ā'rē-ŭs*), in the Greek myths one of the sons of Uranus and Gæa (goddess of the earth), is supposed to have been a symbol of such portents as earthquakes or volcanic eruptions. Thus he had fifty heads and one hundred arms, and was imprisoned in the earth by his father. Jupiter released Briareus and his two brothers and by their help won the victory over the Titans. Homer refers to Briareus as helping Jupiter against the plots of Neptune, Minerva and Juno, and as living in the depths of the sea; while Vergil makes him a guardian of the Titans in Hades.

**Brick.** The earliest made bricks we know anything about were the sun-dried bricks of Egypt, Assyria and Babylonia. Many of these have been preserved for 4,000 years. The burning of bricks in kilns is also quite ancient, some burnt bricks having been found among the ruins of Babylonia. The ancient bricks, whether baked by the sun or in kilns, were made of clay, mixed with grass or straw. The Romans used brick in most of their buildings, and probably introduced them into England. The people of Holland are great brickmakers, and many of their bricks were brought to America in ships, and are still to be found in buildings in New York. All kinds of clay can be used for brick if it has the right materials in it. It must not have too much sand, for then the bricks will fall to pieces; but if there is too little sand, the bricks are apt to crack open. After the clay is dug from the ground, it is usually left in the air, and if it can be exposed through the winter it is all the better, as the frost breaks it up, so that the different materials of the clay can be evenly mixed. When it has been in the air long enough, water is poured on it and it is thoroughly mixed, usually in a mill, though it used to be done by having men tramp it with their bare feet. Anthracite coal-dust is generally mixed with the clay to help in the burning of the bricks. When thoroughly mixed, and all stones and sticks taken out, the clay is put into molds and exposed to the sun to dry. When dried, the bricks are taken to kilns to be burned. Sometimes they are piled up so as to make their own kiln and a fire started inside; by this method half a million or more bricks can be burned at once The time required to burn bricks varies from a few days to two weeks, according to the method used. Machines are often used to press the clay into the molds before burning, which makes the bricks smoother and firmer; but the expense is so much greater that pressed bricks are used only for fine buildings. The red color of bricks is due to the iron in the clay. In some parts of the United States, clay is used which has so little iron that the bricks are cream or buff color. Fire-bricks are made from clay which has in it very little, if any, material which burns easily. They are used for house-grates and other places where there is strong heat. The size of bricks in America varies from $7\frac{3}{4}$ to $8\frac{1}{4}$ inches in length, and from 4 to $4\frac{1}{2}$ inches in width and from $2\frac{1}{4}$ to $2\frac{1}{2}$ inches in thickness. Their weight is usually about four pounds. English bricks are 9 inches long, $4\frac{1}{2}$ inches wide and $2\frac{1}{2}$ inches thick.

**Bride of Lammermoor, The,** a strong and most finished piece of fiction by Sir Walter Scott, published in 1819, and forming one of the famous series of the Waverley novels. Its era is that of William III, and it relates the tragic results of an affection mismated by compulsion. The heroine of the story, Lucy Ashton, daughter of Sir W. Ashton, lord-keeper of Scotland, is in love with Edgar, the young master of Ravenswood, and they plight their troth at the Mermaid's Fountain. Lucy, however, is compelled to marry Frank Hayston, laird of Bucklaw, whom the bride, in a fit of insanity, attempts to murder and then dies in convulsions. Bucklaw, nevertheless, recovers and goes abroad, while Colonel Ashton, Lucy's father, appoints a hostile meeting with Edgar, but young Ravenswood, on

the way to the place appointed, is lost in the quicksands of Kelpies Flow, in accordance with an old prophecy. Admirable, as a foil to the tragic scenes, is the portrayal of Caleb Balderston, the old butler. The story has been at least twice dramatized, while Donizetti's well known opera of *Lucia di Lammermoor* is founded on it, though with some departure in the details of the plot as narrated by the good Sir Walter.

**Bridge,** a structure to carry a roadway over a body of water or above the general level of the ground, as across a valley or depression. When the purpose of the structure is to avoid the expense or inconvenience of a permanent embankment the structure is sometimes called a viaduct. If it is to provide an elevated water channel, it is called an aqueduct. The two parts of a bridge are the substructure and the superstructure. The substructure consists of the foundation and of the abutments and piers.



EADS BRIDGE OVER THE MISSISSIPPI RIVER

The abutments and piers are the parts upon which the superstructure rests. According to the superstructure, bridges are divided into classes as follows: girder, arch, suspension and cantilever bridges. The first three are represented by a plank across a stream, a brick arch and two ropes supporting a suspended platform. The cantilever is a combination of two brackets with a girder between them.

The earliest bridges were made of wood, but masonry arches were made in very early times by both the Romans and Chinese. Cast iron was introduced as a bridge material in the arch bridge across the Severn in 1779. At the present time steel has practically superseded wood for bridge construction.

In a girder bridge there are beams extending from support to support of the substructure. When the beam is not solid, but made up of a network of bars and rods, so that the whole acts like a single beam, it is called a truss. Trusses are of various kinds. The Whipple and Pratt are common trusses in American bridges. There are two long beams or cords connected by diagonals. Early in the century trusses were made of wood, and numbers of such bridges are still in use in the eastern United States. They were later succeeded by combination trusses in which wood and cast iron and wrought iron were used, but all trusses are now more cheaply made of steel.

A peculiar form of the girder bridge was the tubular bridge, which consisted of a rectangular iron tube resting on the piers. The roadbed was through the tube. The Victoria bridge across the St. Lawrence at Montreal is one of the largest and the finest bridges of this kind. It is a railway bridge nearly 1¾ miles long, with a central span 330 feet long and twenty-four spans of 242 feet. It cost $7,000,000. Tubular bridges have been superseded by other forms which are cheaper and better. Arch bridges are made of masonry, of iron, or of steel. One of the largest masonry arched bridges is the Trezzo bridge over the river Adda in Italy. It has an arch with 250 feet span. Of recent arched bridges, the Eads bridge across the Mississippi at St. Louis is one of the best. It consists of three steel arches, the central one of 520 feet span and each of the others of 502 feet span. It carries a double line of railway and an upper roadway for carriages and foot passengers. The arch span of this bridge has since been exceeded by the Garabit bridge in France (span 541 feet) and one other; but the St. Louis bridge is still one of the finest and most beautiful arched bridges in the world. It cost over $6,500,000 and took six years in building.

The first large suspension bridge was the bridge across the Niagara below the Falls. It was built by John A. Roebling in 1852-55, and had a span of 821 feet, at a height of 245 feet above the water. It carried a railroad on the upper platform and a carriage and foot roadway underneath. It was suspended by four cables, each ten inches in diameter and containing 3,640 wires. The largest and finest suspension bridge in the world is the Brooklyn bridge, across the East River at New York. It has a span of 1,600 feet, with a total length of over a mile. The towers are 277 feet high. These towers carry the four suspension cables. Each of these cables is 15½ inches in diameter and composed of 5,282 galvanized iron wires. There is a dis-

BASCULE RAILROAD BRIDGE, TAYLOR STREET, CHICAGO
The old swing bridge is shown in center

tance of 135 feet from high water under the center of the bridge. The bridge has a width of 85 feet, and carries two roadways, two railways and a footway. It was opened in 1883 and cost over $15,000,000. The traffic has increased so that two additional bridges have been built, one to Brooklyn costing $26,000,000 and one to Blackwell's Island costing $17,900,000. It was also proposed to bridge the Hudson River from New York to the New Jersey shore, but the plan has been abandoned, and a tunnel under the Hudson and extending under the East River has been built by the Pennsylvania Railroad.

**Bridge, Cantilever.** The first modern cantilever bridge was built in 1882 across Niagara, although its principle had been approached in one or two earlier bridges. The advantage of the cantilever bridge is partly in its erection and partly in its long spans. It is the only bridge that can compete with the suspension for long spans. The principle of the cantilever can be understood from the drawing. A and B are two towers, C and D is a truss anchored at C, resting on tower A and projecting over the river. EBF is a similar truss on opposite side. DE is a simple truss supported at D and E, so as to transmit only vertical loads. A load on D tends to lift C, but does not effect EBF. A load on DE is divided between C and D and EBF.

The Forth Bridge in Scotland, one of the most notable bridges in the world, is a cantilever bridge. It has a total length of 8,295

CANTILEVER BRIDGE

feet, and has two main spans each 1,710 feet long. The largest cantilever structure in the world is the bridge over East River, at New York, known as Blackwell's Island Bridge, built at a cost of nearly $25,000,000. It is double decked, 8,449 feet in length. The length of the main span is 1,182 feet between the towers. On the lower deck, projecting beyond the trusses, is a roadway wide enough for four three-horse teams to pass abreast. On each side of and apart from this roadway are two trolley tracks. In the middle of the upper deck, between the trusses, there are two elevated railroad tracks and two promenades, each eleven feet wide.

**Bridge of Sighs, The,** leads from the palace of the Doge of Venice to the prisons, whence comes its name. The bridge dates as far back as the close of the sixteenth century. Byron refers to it in *Childe Harold.* The bridge is covered above and at the sides, is handsomely built, and divided into two passages for going and returning. The name has been transferred to a bridge in New York City which connects the Tombs jail with the court of justice.

**Bridge'port,** a railroad and steamboat center and a manufacturing city of Connecticut, lies on Long Island Sound, about fifty-seven miles northeast of New York. It is a fine looking city, has many pleasant environs, and a magnificent esplanade looking out over the sound. It is noted for its manufactures of sewing machines and firearms, automobiles, type-writers, graphophones, silverware and corsets, and it has the largest cartridge factory in the world. Population 125,000.

**Bridges, Robert,** M. A. of Oxford, made poet Laureate of England on the death of Austin (*q. v.*), was born in 1844 on the Isle of Thanet, off the coast of England. He studied medicine and practiced with distinction until 1882 when he retired and devoted himself to literature, in which he had already won distinction. His works include various plays and poems. Among the plays are *Nero, Ulysses,* and *The Christian Captives.* His shorter poems include *The Growth of Love, Prometheus, the Fire Giver,* and *Fros and Psyche.* In the opinion of a distinguished English critic (Arthur Symons), Mr. Bridges "stands alone in our time as a writer of purely lyric poetry."

**Bridge'ton, N. J.,** a port of entry, and capital of Cumberland County, New Jersey, on the Cohansey Creek, thirty-eight miles south of Philadelphia. Two railways connect it with Vineland, eleven miles northeast, and also with towns on the Delaware River and Bay. It is well equipped with schools, among the higher institutions being Ivy Hall Seminary, and a high school, one of the largest in Southern New Jersey, in connection with a good public school system. It has a number of woolen and rolling mills, nail works, glass and carriage factories, is also engaged in fruit and vegetable canning, and manufactures gas-pipe, oilcloth, etc. Population, 14,209.

**Bridg'man, Laura,** a blind mute, was born at Hanover, N. H., Dec. 21, 1829. A bright child, at two fever destroyed sight, hearing and smell, and injured the sense of taste. She learned, however, to make her way about, and even to sew and knit a little. At eight, she went to the Perkins Institute for the Blind, at Boston, where Dr. Howe tried to give her signs by which she could interchange thoughts with others. Then she learned to read raised letters. A set of metal types and a board in which they could be fitted, so as to be read by the fingers, was the next step. In three months she wrote the names of common objects and she learned to know people almost instantly by the touch alone. Later she studied geography, history and algebra, learned to play the piano, to sew and do many other things. Once she asked her teacher: "Man has made houses and vessels, but who made the land and the sea?"

the land and the sea?" and from that time she began to think about religious questions. She also became skillful as a teacher of the blind and deaf and dumb. She died in 1889.

**Bright, John,** an English statesman, was born in 1811. He was a Quaker and member of the Society of Friends, and engaged in the cotton-spinning business. He was always interested in political matters and in social reforms, and was a prominent worker in the anti-corn law league. After his election to Parliament, in 1843, he often spoke against the corn laws until they were repealed. He was active also in working for a general adoption of a free-trade system in England and for extensions of the franchise. A member of the so-called Peace Society, he wished to keep his country out of foreign wars, and tried to have the standing army reduced. He was a member of Gladstone's ministry for a number of years. He was an enlightened statesman and one of the most eloquent speakers of his time. He died in 1889.

JOHN BRIGHT

**Brighton** (*brī'tŭn*), a fashionable watering-place in Sussex, on the English Channel, 50 miles south of London. Built on a slope, rising to a range of chalk cliffs, its healthfulness and the presence of mineral springs have made it popular as a summer resort ever since George IV, then prince of Wales, in 1782 made it his summer residence. Its population is about 131,250, but in addition an average of 30,000 visitors, mostly from London, crowds the resort during the fashionable season. A vast sea wall extends along the coast, and a range of splendid houses fronts the sea for more than three miles, while fine drives and walks render the coast attractive. The Royal pavilion or Marine palace, a fantastic, Oriental structure, is one of the most frequented resorts. A number of well-equipped hotels and fine private residences add to the town's attractions. There are also a college and numerous boarding schools.

**Brinton, Daniel Garrison,** an American army surgeon, extensive writer a high authority on ethnology and archæology, was born in Thornbury, Pa., May 13, 1837, and died at Atlantic City, N. J., July 31, 1899. He graduated from Yale in 1858, and from Jefferson Medical College in 1861, after which he studied in Germany; and returning to the United States, he entered the Union army as a surgeon and rose to the medical directorship of the 11th army corps. In 1865 he settled in Philadelphia. There he undertook for a time the professorship of ethnology in the Academy of Natural Sciences, and in 1886 was professor of American linguistics and archæology in the University of Pennsylvania. He wrote extensively on the ethnology and antiquities of the Indian tribes of America; on the American race and peoples; and on the myths of the New World, etc.

**Brisbane** (*brĭz'bān*), capital of Queensland and the chief trading city of the colony, stands on the Brisbane River, about twenty-five miles from its mouth. The channel has been deepened so that large vessels can approach the city. It was founded in 1825 as a penal colony or settlement for convicts, but did not begin to thrive until it was open to free settlers. A fine iron bridge, 1,080 feet long, connects two parts of the city. There are 70 miles of streets. Trade is carried on with Australian ports and with England. Population, with South Brisbane and suburbs, 143,000.

**Bris'tol Chan'nel,** an inlet of the Atlantic Ocean, in the southwest of England. It is the largest inlet in Britain, with an irregular coast line of 220 miles. It is about eighty miles long and from five to forty-three miles wide. The tides in it rise to an unusual height. The so-called bore occurs here, as in many inlets. It is a wall of water, sometimes from six to nine feet high, which passes up the channel, being produced by the rapid rising of the tide, which pushes the water against the current up the ever-narrowing mouth of the river more rapidly than it can smoothly flow.

**Bris'tol** is an English mercantile city on the Avon, forming by itself a county. An ancient city, it has taken a prominent part in history. The Cabots sailed from that port on their voyages of discovery in the New World. Bristol men settled Newfoundland, made several attempts to colonize Maine, and established a large trade with the West Indies and the American colonies. Here was built, in 1838, the first transatlantic steamship, the Great Western. Colston the philanthropist founded many charities here, and a day is yearly kept in his honor. Southey was a native of Bristol, and with Coleridge spent many of his early days in the place. The old but beautiful St. Mary Redcliff church was declared by Queen Elizabeth to be "the fairest and most famous parish church in England." Here are two colleges, numerous schools and a free library. Its trade is large. Population, 338,945.

**Bristol, R. I.,** an old historic town, the seat of Bristol County, on Narragansett Bay, also a port of entry, largely availed of, owing to its excellent harbor, where there

is a considerable industry in boat-building. It is situated 13 miles south-southeast of Providence, and 7 miles southwest of Fall River, Mass., and is reached by the New York New Haven & Hartford railroad. The peninsula, it is thought, was the Vineland of the Norsemen, and near by were the hamlets of the Narragansett Indian chiefs, Massasoit and King Philip. The place has an early history, the charter of the town dating from the year 1680. It has a number of good schools and a handsome public library, while its industries, besides yacht and boat building, include woolen and cotton mills and rubber works. During the Revolutionary War the town was entered and considerable damage done by the English. Population, 8,565.

**Bristol, Tenn. and Va.,** formerly a consolidated city, the seat of Sullivan County, Tenn., and of Washington County, Va. (Bristol of the latter State being formerly named Goodson). The division line between the two states runs along the main street of the now common city. Though settled in 1851, the present town charter was adopted in 1898, and revised in 1901. The cities now have separate governments, that of Bristol being under a commission. It is reached and served by two railroads, the Southern and the Norfolk & Western road. Its industries embrace furniture, pulp, lumber and flour mills, a tannery and ice and tobacco factories. It is the seat of King College (Presb.), Sullins College (M. E., So.) and the Southwest Virginia (Bapt.) Institute for women, besides a normal school for negroes. Population (1910), 13,395; Bristol (Tenn.), 7,148 and Bristol (Va.), 6,247.

**Brit'ish America** is the whole of North America north of the United States, under the British flag, except Alaska. It includes almost 3,696,146 square miles. It is divided into the Dominion of Canada, its provinces and territories, and Newfoundland; population, 7,429,869. See CANADA.

**British Columbia,** Canada's maritime province on the Pacific Ocean, is the largest in the Dominion, its area being variously estimated at from 372,630 to 395,610 square miles. It is a great irregular quadrangle, about 700 miles from north to south, with an average width of about 400 miles, lying between latitudes 40° and 60° north. It is bounded on the south by the Strait of Juan de Fuca and the States of Washington, Idaho and Montana, on the west by the Pacific Ocean and southern Alaska, on the north by Yukon and Mackenzie Territories, and on the east by the Province of Alberta. From the 49th degree north to the 54th degree the eastern boundary follows the axis of the Rocky Mountains and thence north to the 120th meridian. Pop. 502,283.

The province is traversed from south to north by four principal ranges of mountains—the Rocky and the Selkirk on the east and the Coast and Island ranges on the west. The Rocky Mountain range preserves its continuity, but the Selkirks are broken up into the Purcell, the Selkirk, the Gold and the Cariboo Mountains. Between these ranges and the Rockies lies a valley of remarkable length and regularity, extending from the international boundary line, along the western base of the Rockies northerly 700 miles. West of these ranges extends a vast plateau or table land with an average elevation of 3,500 feet above sea level, but so worn away and eroded by water courses that in many parts it presents the appearance of a succession of mountains. In others it spreads out into the wide plains and rolling ground, dotted with low hills, which constitute fine areas of farming and pasture lands. This interior plateau is bounded on the west by the Coast Range, and on the north by a cross range which gradually merges into the Arctic slope.

*Rivers and Lakes.* One of the noticeable physical features of British Columbia is its position as the watershed of the North Pacific slope. All the great rivers flowing into the Pacific Ocean, with the exception of the Colorado, find their sources within its boundaries. The more important of these are the Columbia (the principal waterway of the state of Washington), which flows through the province for over 600 miles; the Fraser, 750 miles long; the Skeena, 300 miles; the Thompson, the Kootenay, the Naas, the Stikine, the Liard and the Peace. These streams with their numerous tributaries and branches drain an area equal to about one tenth of the North American continent. The lake system of British Columbia is extensive and important, furnishing convenient transportation facilities in the interior. Some of the principal lakes are Atlin, area 211,600 acres; Babine, 196,000 acres; Chilco, 109,700 acres; Kootenay, 141,120 acres; Upper Arrow, 64,500 acres; Lower Arrow, 40,960 acres; Okanagan, 86,240 acres; Shuswap, 79,150 acres; Harrison, 78,400 acres.

Many of the smaller streams are not navigable but these furnish driveways to the lumbermen and supply power for sawmills and electric plants and water for irrigation. Water power is practically unlimited and so widely distributed that no portion of the province need be without cheap motive power for driving all necessary machinery.

*Climate.* Varied climatic conditions prevail in British Columbia. The Japanese current and the moisture-laden winds from the Pacific exercise a moderating influence upon the climate of the coast and provide a copious rainfall. The westerly winds are arrested in their passage east by the Coast

Range, thus creating what is known as the dry belt east of those mountains, but the higher currents of air carry the moisture to the loftier peaks of the Selkirks, causing the heavy snow fall which distinguishes that range from its eastern neighbor, the Rockies. Thus a series of alternate moist and dry belts is formed. As a consequence of the purity of its air, its freedom from malaria and the almost total absence of extremes of heat and cold, British Columbia may be regarded as a vast sanitarium.

The climate of Vancouver Island and the coast generally corresponds very closely with that of England; the summers are warm with much bright sunshine, and severe frost scarcely ever occurs in winter. On the mainland similar conditions prevail till the higher levels are reached, where the winters are cooler. At Agassiz, on the Lower Fraser, the average mean temperature is in January 33 degrees and in July 64 degrees; the lowest temperature on record at this point is 13 degrees, and the highest 97 degrees. There are no summer frosts, and the annual rainfall is 67 inches, 95 per cent. of which falls during the autumn and winter.

To the eastward of the Coast Range, in Yale and West Kootenay the climate is quite different. The summers are warmer, the winters colder and the rainfalls are rather light—bright dry weather being the rule. The cold of winter is, however, scarcely ever severe, and the hottest days of summer are made pleasant by the fact that the air is dry and the nights are cool. Further north, in the undeveloped parts of the province, the winters are more severe.

*Resources.* With the exception of nickel (which has not yet been discovered in quantity) all that the other provinces of Canada boast of possessing in the way of raw material is here in abundance. British Columbia's coal measures are sufficient to supply the world for centuries; it possesses the greatest compact area of merchantable timber in North America; the mines have produced $430,000,000 and may be said to be only in the early stages of development; the fisheries produce an annual average of over $12,000,000, and apart from salmon fishing their importance is only beginning to be realized; there are immense deposits of magnetite and hematite iron of the finest quality which still remain undeveloped; the agricultural and fruit lands, cattle ranges and dairies produced approximately $22,000,000 in 1912; and less than one tenth of the available land is settled upon, much less cultivated; the province has millions of acres of pulpwood as yet unexploited; petroleum deposits, but recently discovered, are among the most extensive in the world; and much of the province is still unexplored and its potential value unknown. With all this undeveloped wealth within its borders can it be wondered at that British Columbians are sanguine of the future?

*Agriculture.* Considerable tracts of land in the province are highly suitable for mixed farming, and in some districts fruit growing is extensively and most profitably engaged in.

*Education.* The educational facilities of the province are varied and excellent. The expenditure for schools amounts to over $1,100,000 a year. The government builds a schoolhouse, makes a grant for incidental expenses and pays a teacher in every district where 20 children between the ages of 6 and 16 can be brought together. For outlying farming districts and mining camps the arrangements are very satisfactory. High schools also are established in cities, where classics and mathematics are taught. Several of the cities in the province have full charge of their own public and high schools, and these receive a very liberal per capita grant in aid from the provincial government.

*Trade and Transportation.* In 1903 the imports amounted to $11,141,068, and the exports totalled $15,604,896. In 1913 the imports were $66,595,479 and the exports $27,087,369, or a total increase in the trade of the province of over $66,000,000 in ten years. The leading articles of export are fish, coal, gold, silver, copper, lead, timber, masts, spars, furs and skins, whale products, fish-oil, hops and fruit. A large portion of the salmon, canned and pickled, goes to Great Britain, eastern Canada, the United States, Hawaiian Islands, Australia and Japan; the United States consumes a large share of the exported coal; and immense quantities of lumber are shipped to Great Britain, South Africa, China, Japan, India, South America and Australia. A large interprovincial trade with Alberta, Saskatchewan, Manitoba and the eastern provinces is rapidly developing, the fruit grown in British Columbia being largely shipped to the prairie provinces, where it finds a good market. With the shipping facilities offered by the Canadian Pacific Railway and its magnificent fleets of steamships running to Japan, China, New Zealand, Australia and Hawaii, backed by her natural advantages of climate and geographical position, British Columbia's already large trade is rapidly increasing. The tonnage of vessels employed in the coasting trade is 12,025,510 tons, and of sea-going vessels carrying cargoes to and from the ports of the province, 4,672,058 tons. The Canadian Pacific is the principal railway in the province. It has two main lines, the Canadian Pacific Railway and the Crowsnest Pass Railway, and several branches and steamboat connections on the inland lakes, besides its large fleet of ocean-going and coasting steamers. The railway mileage of the province is about 2,000 miles.

The Canadian Pacific Railway Company operates the Esquimalt and Nanaimo Railway on Vancouver Island, running from Victoria to Alberine, a distance of 145 miles. The company also administers the Esquimalt and Nanaimo land grant, some 1,500,000 acres, the settlement of which required the extension of the Esquimalt and Nanaimo main line and the building of branches.

*Districts of British Columbia.* British Columbia is divided into the following districts:

| | |
|---|---|
| Kootenay (East and West) | 15,000,000 acres |
| Yale | 15,500,000 " |
| Lillooet | 10,000,000 " |
| Westminster | 4,900,000 " |
| Cariboo | 96,000,000 " |
| Cassiar | 100,000,000 " |
| Comox (Mainland) | 4,000,000 " |
| Vancouver Island | 10,496,000 " |

Additional information concerning each of these districts is given elsewhere in these volumes.

**British East Africa.** This territory, governed directly from the foreign office, includes an immense area on the mainland as well as the islands of Zanzibar and Pemba, which are immediately under the control of their Arab sultan. To the north and east the British sphere of influence (which merges with the Sudan provinces of Egypt) is bounded by the Juba River as far as the sixth parallel of north latitude, along that to the thirty-fifth meridian of east longitude, and up that meridian to the Blue Nile. It marches with the Italian sphere of influence and with Abyssinia to the Egyptian frontier. On the south the territory runs northwest from the north bank of the mouth of the Umba River to the north of Kilimanjaro to the point where the first parallel of south latitude meets Lake Victoria and thence across the lake westward of that parallel to the frontier of the Congo Free State at the thirtieth meridian of east longitude and on north to the Nile-Congo watershed. North of the source of the Mbomu the British sphere is without limitation, extending to the independent Muslim states of those parts. Its total area is probably in excess of a million square miles. The Imperial British East Africa Company, which had been instrumental in opening up the territory under concessions from the Sultan of Zanzibar, evacuated its territory in favor of the government on June 30, 1895, and the entire land was divided into the British East Africa Protectorate and the Uganda Protectorate for purposes of administration.

**British East Africa Protectorate, The,** extends from the Umba to the Juba River, running as far inland as the Uganda boundary, with an area of about 177,100 square miles, and a population of 4,038,000, of which 25,000 are Asiatics and 2,000 Europeans or of mixed European and Asiatic blood. The capital is Mombasa, with a population of 30,000. It is divided into seven provinces and an unorganized territory lying to the north and west, each under a subcommissioner. These, with their districts and subdistricts, are as follows: Mombasa, where the commissioner and commander-in-chief has his residence and where the courts of justice are situated, is in the province of Seyidie, which includes the districts of Vanga, Mombasa, Malindi and Taita and the subdistricts of Rabai, Takaungu and Taveta; Ukamba includes the districts of Masailand and Ulu, with Nairobi for its capital; Tanaland has for its districts Lamu and the Tana River, and Lamu for its capital; Jubaland is divided into Upper and Lower Jubaland, Kismayu being the capital; Kenya into Fort Hall and Nyeri, governed from Fort Hall; Naivasha is the name of both the capital and province and includes the districts of Naivasha, Eldama Ravine and Baringo; and Kisumu includes Kisumu, Mumias, Nandi, Kericho, Soba and Ugaya, its capital Port Florance.

The chief imports were cotton goods, provisions, rice, grain and flour and building materials; the chief exports ivory, copra, grain and hides and horns.

The Mombasa-Victoria Railway is now 584 miles long. There are 7 telegraph lines with a total length of 1,422 miles, from Mombasa to Lamu, Mombasa to Kisumu and Kisumu to Entebbe in Uganda. A cable connects Mombasa and Zanzibar.

**British Museum,** a great national institution, on Great Russel Street, London. It was opened in 1759, and is constantly growing in size and value. The present building was erected at an expense of several millions. There are eleven departments. The largest one is that of *Printed Books*. There are upwards of two million books, and many of them old and rare; in the collection are the libraries of several English kings and great Englishmen; and books in all languages. The reading room, under the vast dome, larger than that of St. Peter's, has over 600 readers daily. The departments of *Maps* and *Manuscripts* are also valuable. That of *Prints and Drawings* contains works of the great masters, drawings of Michael Angelo, Raphael, etc.; fine collections of etchings by Rembrandt and of engravings by Hogarth. The department of *Oriental Antiquities* includes Egyptian monuments and the celebrated Rosetta stone, which furnished the key to the hieroglyphics, and the results of excavations in Assyria. One of the finest branches of the museum is the department of *Greek and Roman Antiquities*. Here are fine collections of the sculptures of Athens and Attica, among them the famous decorations of the Parthenon, which form the most valuable monument of Greek art which has come down to modern times. Besides the other departments of *Zoology*, *Botany*, *Geol-*

*ogy*, etc., the *Natural History Museum* at South Kensington has also been added to the British Museum, making it one of the finest institutions of the kind in the world.

**British New Guinea.** The British portion of the island of New Guinea has been taken over by the commonwealth of Australia, by a federal act which went into force in 1906, the assumed region now being known as the Territory of Papua. The work of civilization is going on rapidly, great tracts of territory being now occupied by peaceful natives, falling more and more under missionary influence. There are three ports of entry, Port Moresby, Samarai and Laru, with a central court at the first named, the whole territory being divided into six districts for purposes of justice The D'Entrecasteaux and Louisiade groups of islands are included in the New Guinea territory. The revenue, derived largely from import duties in 1907, amounted to $398,355, and the exports for the same year were $401,450. The great forests of the island yield valuable timber and precious woods; gold has been found on the Louisiade Islands, on Woodlark Island and to some extent on the mainland. The principal exports are trepang, copra, pearl shell and pearls, gold, coffee and rubber; the imports are food stuffs, tobacco, cloths and hardware. Nearly all the trade is with Queensland and New South Wales, and for postal and all other purposes the island is treated now as part of the Australian Commonwealth.

**Brit'tany,** an ancient province of France, consisting of the great northwestern peninsula, which is shaped like a triangle. It now forms five departments, Finistère, Côtes-du-Nord, Morbihan, Ille-et-Vilaine and Loire-Inférieure. It is also usually divided into Upper and Lower Brittany. It covers 13,643 square miles. The Bretons, as the people are called, numbering about 3,224,369, are peculiar in many ways. They are strongly attached to their country and customs, and oppose all changes. During the French Revolution they were loyal to the old house of Bourbon. Though not noted in matters of commerce and manufactures, they are among the boldest seamen in the world and are to be met with in the most distant waters. British colonies settled here as early as the 3d century, and by the 5th century had changed the original name of Armorica to Brittany. It was at different times under the sway of Italy, but gradually became a part of France. The Breton folk-lore and folk-songs consist of a vast wealth of traditional stories and songs. The country abounds in remains of the ancient religion of the Druids. Brittany has given many great men to the world, among them Abelard, Jacques Cartier, Châteaubriand, Jules Simon and Ernest Renan. Rennes, once the capital of ancient Brittany, is now the capital of the French department of Ille-et-Vilaine. Population, 79,372.

**Brobdingnag** (*brŏb'dĭng-năg'*), a wonderful land, described by Dean Swift in his *Gulliver's Travels*, the inhabitants thereof and all natural objects being of gigantic size; hence, to speak of a man as brobdingnagian is to signify one of unusual, indeed of mammoth, height. The term indicating this strange, imaginative land, is frequently, though incorrectly, spelled *Brobdignag*.

**Brock, Sir Isaac,** administrator of the province of Upper Canada (now Ontario) for two sessions of Parliament. Commander of the forces of the province and the representative of His Majesty as well administering its civil affairs. War was declared by the United States against Great Britain on the 18th of June, 1812, and the province was invaded. General Brock's military record is a splendid one. He fell on the 13th day of October, 1812, while bravely leading a charge up Queenston Heights. A few hours after his death the enemy's position was taken, and the American army and its commander surrendered. A handsome monument in memory of his achievements was erected by the province on Queenston Heights.

**Brocken, The.** See WALPURGIS NIGHT.

**Brock'ton,** a city in Plymouth Co., Massachusetts. It received its present name in 1874, having formerly been called North Bridgewater. It is a wealthy place and quite a business center. The manufacture of boots, shoes and rubber goods is carried on extensively. Shoe machinery and supplies, tools, bicycles, etc. are also made here. The city has admirable public schools and valuable school property. Population, 61,500.

**Brock'ville,** a city of 9,000 in eastern Ontario, is beautifully situated on the St. Lawrence River near the Thousand Islands, and is called after General Brock. It is the center of a rich dairying district, and has a large cheese market. One of the hospitals for the insane owned and maintained by the province is located here, occupying a commanding position overlooking the St. Lawrence River. It is served by both the Grand Trunk and Canadian Pacific Railways.

**Brok** or **Brock,** was one of the dwarfs in the Norse mythology, skilled in handwork, who, having incurred the wrath of Odin, was sent by him to work in the under darkness.

**Brontë** (*brŏn'tĕ*), **Charlotte,** one of the most gifted of English novelists, who wrote under the pen-name of Currer Bell, was born at Thornton, in Yorkshire, in 1816. Almost all her life was one of sorrow and struggle, which showed itself in her character and in her books. She herself was the heroine of *Jane Eyre*, her greatest novel; and the Lowood of that story was

a picture of her own sad school-life. She had two sisters, also with decided literary talent, and their death still further darkened her life. Her other chief novels are *Shirley*, *Villette* and *The Professor*. *Jane Eyre* has been translated into most European languages, and dramatized in England and Germany, under the title of *The Orphan of Lowood*. She died in 1855, having in the previous year married the Reverend Arthur Nicholls, her father's curate. See Mrs. Gaskell's *Life of Charlotte Brontë*.

**Bronze** (*brŏnz*), an alloy of copper and tin. It is harder than copper but less malleable. It was long used by the ancients for weapons and utensils, and is now widely used for statues, machinery and cannon. It is also used for parts of telescopes. In making bronze, the metals are melted separately, and then poured together, stirred and turned into molds. The many varieties of bronze have different proportions of the metals, and lead, zinc and silver are sometimes added. Bell metal has seventy-eight parts of copper and twenty-two of tin. Cannon metal has much more copper. The temperature of the alloy when poured and the rapidity of cooling also have an effect on the quality of the bronze. Copper and aluminum also produce an alloy called bronze.

**Bronze, Age of,** a term used to denote the stage of culture of a people using bronze for weapons, cutting tools, etc. Before it comes the Age of Stone, and after it the Age of Iron. This order of development is not true of all nations, nor did these different stages exist at the same period in all nations. Thus, in the time of Homer, the Greeks were passing from the use of bronze to that of iron; while the Mexicans were still in the bronze age in very recent times. Among the tools and weapons of the bronze age are knives, saws, sickles, awls, hammers, anvils, axes, swords, spears, arrows, daggers and shields. The forms of these articles were constantly changing from one age to another, and also during the progress of a single age. The composition of the bronze used was about ninety parts of copper and ten of tin.

**Brookline, Mass.,** an old historic town, now an elegant residential suburb of Boston, in Norfolk County, connected with Boston by steam and street cars (a three-mile ride). It lies on the Charles River, and has many fine villas and country seats; it is also reached by the Boston and Albany R. R. Annexation has frequently been proposed to it by Boston, but it coyly refuses the temptation to join the city. It has some manufacturing interests, chiefly of electrical supplies, screens, etc.; it also has a riding academy and a public library. The population is now 31,934.

**Brooklyn, N. Y.** (See NEW YORK CITY.)

**Brooks, Phillips,** late Episcopal bishop of Massachusetts, was born at Boston in 1835, and graduated at Harvard College and at the Theological Seminary at Alexandria, Va. He was rector for some years of churches in Philadelphia, and in 1869 was made rector of Trinity Church in Boston. In 1891 he was elected bishop of Massachusetts. He was one of the finest pulpit-orators of any denomination—a man of high ideals, spiritual thought and commanding influence. See his *Life and Letters*, by Prof. Alex. V. G. Allen. Bishop Brooks died at Boston Jan. 23, 1893.

PHILLIPS BROOKS

**Broom** (*Cytisus scopatius*), an evergreen shrub found growing on heaths and on dry soils, bearing twig-like branches and large yellow flowers. The tough twigs are made use of for thatching purposes and in the making of besoms or brooms for household sweeping. The *Cytisus albus* or white broom is a native of Europe and much cultivated in England as an ornamental shrub. It attains frequently a height of from 12 to 15 feet, and its white flowers are much admired. A Spanish variety is used for its medical properties, its tops and seeds, which are strongly diuretic, being beneficial in cases of dropsy. The broom, the *planta genista*, as it is known, gave its name to the Plantagenet royal family, an ancestor of which used the broom for his crest.

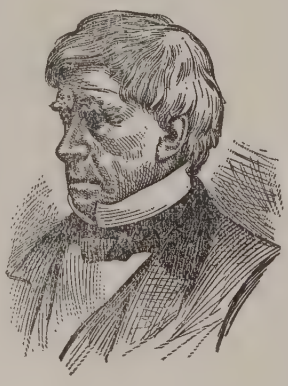
**Broom-Corn** (*Sorghum vulgare*), a native of the East Indies, largely cultivated in the United States. It grows to the height of eight or ten feet, has a jointed stem, the panicle of which is extensively used in the manufacture of whisks and brooms. It is sometimes utilized for forage, but is not of much value as such. It is propagated considerably in Kansas and Nebraska as well as in the east, and chiefly in the Mohawk Valley of New York state An acre will produce from 500 to 600 pounds of the material for making brooms.

**Brotherhood of Andrew and Philip,** founded in 1888 by the Rev. Dr. Rufus W. Miller, of Philadelphia, present President of the General Council. The organization, which held its first federal convention in New York city in 1893, is composed of members of 23 Evangelical denominations, in this country, besides chapters in Australia and Japan. Its objects are indicated in the statement that "any man can be-

long to the Brotherhood who will promise to pray daily for the spread of the Kingdom of Christ among men and to make an earnest effort each week to bring at least one man within the hearing of the Gospel." The number of chapters of the Brotherhood in the United States is, at present writing, 875, with a total membership of 25,000 in 44 states.

**Brotherhood of St. Andrew, The,** is an organization with objects in view similar to those of the Brotherhood of Andrew and Philip, though its operations are confined to men of the Protestant Episcopal Church. The Brotherhood was organized June 12, 1896, and has 1,200 active chapters, with a membership of about 14,000 men. It also includes a junior department to train young men and older boys for Christian work. The latter has 400 chapters in the United States, with a membership numbering about 5,000. A similar general organization has been formed in the Scottish Episcopal Church, while chapters of the Brotherhood have also been formed in the Episcopal Church in Australia and in the Canadian Dominion.

**Brougham** (*brōō'am* or *brōōm*), **Henry, Lord Brougham and Vaux,** was born at Edinburgh in 1778. He was called to the English bar and soon after entered Parliament, taking sides with the Liberals. He spoke against slavery and was active in all measures of reform. He became immensely popular with the people and wielded a great influence, being recognized by the Liberals as their leader in debate. He received a peerage and became lord chancellor in the so-called Reform Ministry. As an advocate, also, though he never had a large practice, he attained some fame, his greatest speech being that in behalf of Queen Caroline against George IV. He was interested in science and literature, and his writings cover a wide range of subjects. The founding of London University was largely due to him. As an orator he was inferior only to Canning among the men of his time. He was peculiar in many ways, and while for many years the popular idol was not liked by those who worked with him. He built a chateau at Cannes, in the south of France, and died there in 1868. It was once said of him as he was passing along in a carriage: "There go Solon, Lycurgus, Demosthenes, Archimedes, Sir Isaac Newton, Lord Chesterfield and a great many more in one post-chaise."



LORD BROUGHAM

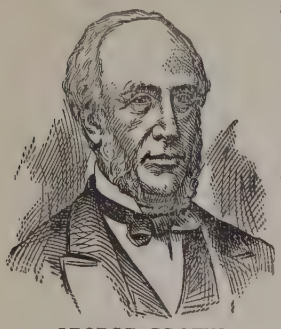
**Broughton** (*brą'tŭn* or *brou'tŭn*), **Rhoda,** an English novelist, was born in North Wales, November 29, 1840, and for forty years has actively been engaged in the production of fiction. In 1867 she made her successful *début* with her popular novel, *Cometh Up as a Flower*, which was followed by *Not Wisely but Too Well* and in 1870 by *Red as a Rose is She*. Her later stories include *Nancy*, *Joan*, *Second Thoughts*, *Belinda*, *Dr. Cupid*, *Alas! Dear Faustina*, *The Game and the Candle*, *Foes in Law* and *Lavinia*.

**Brown, Charles Brockden,** an early American novelist, much prized in his day, was born at Philadelphia in 1771, and died there in 1810. His two best-known stories are *Wieland* [*or the Transformation* and *Arthur Mervyn*. The former is an alluring though improbable tale, of a ventriloquist, who, by personating a supernatural being, leads the hero to kill his wife and children; the latter gives a vivid description of Philadelphia, when, in 1783, the city was scourged by yellow fever. His other stories, *Ormond*, *Edgar Huntley*, *Jane Talbot* and *Philip Stanley* are now but little read. Early in the century he brought out semi-annually for a time *The American Register*, a useful work of literary and historic reference.

**Brown, Elmer Ellsworth.** Born in Chatauqua County, New York, in 1861, Mr. Brown graduated from the Illinois State Normal University in 1881, and afterward studied both in the University of Michigan and abroad, receiving his degree of Doctor of Philosophy in Halle, Germany, in 1890. He was principal of schools in Belvidere, Ill., for three years, and in Jackson, Mich., for one year. From 1884 to 1887 he was assistant state secretary of the Y. M. C. A. in Illinois. After returning from Germany, Mr. Brown became assistant professor of the science and art of teaching in the University of Michigan, and in 1893 he became professor of the theory and practice of education in the University of California. In 1906 President Roosevelt appointed him as successor to Dr. William T. Harris in the office of United States Commissioner of Education. He is the author of *The Making of Our Middle Schools*.

**Brown, Hon. George,** born in Edinburgh in 1821. Came to New York in 1838. In 1843 the family came to Toronto (Canada). In 1844 *The Globe* was first published. With it the name of George Brown is inseparately and honorably connected. Since its first publication it has been a powerful force in Canada. In 1848 it became the organ of the Liberal government.

In 1851 Mr. Brown was elected to Parliament for Kent County (western Ontario), and took his seat in 1852. In 1854 he was elected for Lambton. In 1857 he was returned for two ridings at the same time: North Oxford and the City of Toronto. Called on to form an administration which was short-lived. He was mainly influential as editor of *The Globe*, and one of the fathers of confederation. He died on May 9th, 1880.



GEORGE BROWN

**Brown, Henry Billings,** associate-justice of the United States supreme court, was born at South Lee, Mass., March 2, 1836, and after graduating at Yale studied law and was admitted to the bar in Wayne County, Mich., in July, 1860. From 1861 to 1863 he was deputy United States marshal for his district, and from 1863 to 1868 acted as assistant United States attorney for the eastern district of Michigan. He afterwards practiced law at Detroit, and from 1875 to 1890 he was United States judge for the eastern district of his state (Michigan), and compiler for a number of years of Brown's *Admiralty Reports*. In January, 1891, he was appointed to the United States supreme court as an associate-justice, taking up his residence at Washington, D. C.

**Brown, John,** an American abolitionist, was born at Torrington, Connecticut, May 9, 1800. Descended from one of the Pilgrims who landed in the *Mayflower*, he retained the old Puritan spirit of sternness. The idea of liberating the slaves early became his master passion. Having failed in business, he settled on a farm in New York state, from which he was called by his sons, who had settled in Kansas, to assist them in the struggle then going on between the pro-slavery and anti slavery men. Here he became a leader in the border warfare. His most famous engagements were the combat of Black Jack, where he drove back a superior force of Missourians, and the encounter from which he received the name of Ossawatomie, resisting for almost an hour a body of 500 men with only 15 men, and then making good his escape. He assisted a number of slaves to escape to Kansas, and tried to interest people in the east in his plans; but he was looked upon as a fanatic. He planned to attack slavery on its own ground, and relied on the slaves rallying to his standard to make good his attack. He even drew up a constitution and elected officers, but claimed that he had no intention of overthrowing the government. His plan included the seizure of the United States arsenal at Harper's Ferry, Virginia. Going to Hagerstown, Maryland, near Harper's Ferry, Brown took a farm and gradually gathered about twenty-two persons, seventeen of them being white men. Arms and ammunition were secretly shipped to him, and on the night of October 16, 1859, he seized the arsenal, liberated the slaves of the city, and captured sixty citizens. But the negroes failed to rally around him; his men were gradually picked off, though a number of the citizens were also killed; and on the morning of the 18th the door of the engine room to which he had retreated was battered down, and he and the few survivors were overpowered and captured by United States troops under Col. Robert E. Lee. Brown was taken to Charlestown, Virginia, and tried and condemned for treason and murder. To the last he preserved his dauntless bearing, freely admitted the object of the attack, and only deplored its failure. He was hanged December 2, 1859. His attempt and death and the investigations that followed undoubtedly had an effect in bringing to a focus the difference of opinion between the two sections of the country on the question of slavery, and hurried on the Civil War.

**Brown, John** (1810–1882), a Scottish author and physician, is known by his charming series of essays and short stories. He was fond of children and dogs, and his best stories are on these subjects. He wrote of nothing that he did not thoroughly know and love, saying that no one should publish anything "unless he has something to say, and has done his best to say it aright." Accordingly, his works are few but of the best quality. His rich sense of humor and his pathos make his works deeply interesting, and these two qualities reached their perfection in his stories of the uncouth but intelligent mastiff, *Rab and his Friends*, and the little girl, *Marjorie Fleming*. *Spare Hours* and *John Leech and Other Papers* comprise almost all his works.

**Brown, Joseph Emerson,** American politician, war governor of Georgia and for a time chief justice of the state supreme court, was born in South Carolina in 1821, and died at Atlanta, Ga., November 30, 1894. In 1849 he was elected to the state senate of Georgia, and was Democratic governor of the state successively from 1857 to 1863. When the Civil War broke out, he became an active secessionist, and on January 3, 1861, he seized Forts Pulaski and Jackson, near Savannah, a fortnight before his state seceded, and also took possession of the United States arsenal at Augusta. He warmly espoused the southern cause and was a stout supporter of the Confederate government, though he disputed the con

stitutionality of Jefferson Davis's acts of conscription. Near the close of the war he was imprisoned for a time by the national government, but, being released, he resigned his governorship, and in 1866 visited Washington and urged his state to accept the issues of the struggle and comply with the pacific measures of reconstruction. This made him unpopular with the south and his Democratic friends, and for a while he joined the Republicans, only, however, to return at length to his own political fold. He was afterward a member of the United States senate. He left a considerable fortune, though he was a large benefactor of the Georgia University and of the Southern Baptist Theological Seminary at Louisville, Ky.

**Brown University,** an institution for the higher learning, belonging chiefly to the Baptist denomination, but nonsectarian. located at Providence, R. I. It was founded at Warren, R. I., in 1764, under the name of Rhode Island College, but was in 1770 removed to Providence and named after Nicholas Brown, a philanthropic merchant and legislator of the state, who contributed $100,000 to its endowment. It has about 80 instructors, and nearly 1,000 students are on its contemporary rolls. It has turned out over 4,500 graduates. The university buildings are extensive and include, besides a well-furnished library, an observatory equipped with one of the most powerful telescopes in America.

**Brown-Sequard, Charles Edward** (1818–94), Franco-American physician and physiologist, skilled in the treatment of nervous diseases, was born in the island of Mauritius, his father being a Philadelphian and his mother a French woman of the name of Sequard. He studied medicine in Paris, where he graduated an M.D. in 1840, afterwards gaining distinction by his important researches in neurology and by his experiments on the composition of the blood, on the muscular and nervous systems and on the spinal cord. From a professional post in London, he came to the United States, where he occupied the chair of physiology and pathology at Harvard (1864–68), returning in the latter year to Paris, where he lectured at the School of Medicine, and then spent five years (1873–78) as a practitioner in New York. Returning once more to Paris, he filled for a time the chair of experimental medicine at the College de France, won a notable prize awarded by the Academy of Sciences, and published several professional works, besides editing one or two medical journals. His more important publications include his lectures on the *Physiology and Pathology of the Nervous System, Diagnosis and Treatment of the Lower Extremities* and *Lectures on Nervous Affections.*

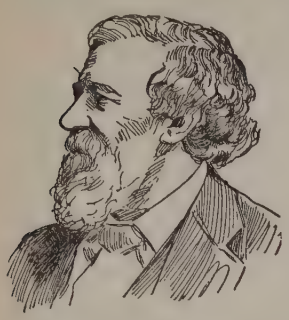
**Browne, Charles Farrar,** was born at Waterford, Me., April 26, 1834. He began life as a printer, then acted as a reporter for a weekly paper in Cincinnati. His first letter signed with the famous name Artemus Ward pretended to be from a traveling showman, and was published in a Cincinnati paper. He edited a humorous paper, *Vanity Fair*, in New York, gave humorous lectures and brought out *Artemus Ward: His Book.* He published three other volumes of the same nature, which were all successful in their line. His last years were spent in England, where he was a contributor to *Punch.* He died at Southampton, England, March 6, 1867.

**Browne, Thomas Alexander** (Rolf Boldrewood), the novelist, was born in London, August 6, 1826, went in early life to Australia and was educated at Sydney College. He led the life of a pioneer in Victoria, holding the position of police magistrate and warden of Goldfields until 1895. His sixteen novels, all written since 1888, deal with Australian life in some of its roughest as well as in its most civilized aspects, though Mr. Browne's style lends itself rather to vigorous than merely polite treatment.

**Brown'ing, Elizabeth Barrett,** a great English poet, was born at Carlton Hall, Durham, England, March 6, 1809. Her wonderful talents were early shown. At ten she could read Homer in the Greek, and at fourteen she wrote an epic on the *Battle of Marathon.* An early injury and the shock received from the death of her brother by drowning made her an invalid for the greater part of her life; but she wrote constantly and enjoyed the society and admiration of some of the greatest literary men of the day. Among her earlier poems is the fine lyric, *The Cry of the Children,* a noble outburst over the wrongs of young children employed in factories. In 1846 she married the poet, Robert Browning, and from that time made her home in Florence. Italy was then struggling to lift itself into an independent and united kingdom, and many of Mrs. Browning's finest poems were written in the interest of her "adopted country." Among the latter is *Casa Guidi Windows,* which takes the name from the building in which the authors lived. The translation of *Prometheus Bound* and the poem *Aurora Leigh* are among her finest efforts. She died June 30, 1861, and the city of Florence placed an inscribed tablet to her memory on the walls of Casa Guidi. Mrs. Browning has been described as "a soul of fire in a shell of pearl." But few of her sex have ever approached her in poetic genius.

**Browning, Robert.** It is unfortunate when the work of a gifted poet is the subject of controversy, for it delays general understanding and acceptance of his message. It is admitted to-day by many of Browning's warmest admirers that the early

Browning Societies claimed too much for him, and created a wide impression that he was difficult. He had certain obscurities of style, it is true, but these were magnified by the idea that they concealed a profundity of thought whose beauty could be comprehended only by the intellectually elect. This discouraged spontaneous reading. Now it is beginning to be understood that Browning's message was simple and direct, and to all mankind that struggles and strives after moral good. Through the poets that immediately preceded him we learned to look for God in nature, the spiritual solace and growth to be found in keeping close to simple, natural things. Browning spent a half century in teaching the uplifting power of human life and work—the beauty of sublime faith, dauntless courage and deathless love to lift us to heights unattained and give us thence the farther vision into the world beyond.



ROBERT BROWNING

This subtlest seer of the soul, as he has been called, was born in a suburb of London, May 7, 1812, and was brought up in that human maelstrom, surrounded by it, a part of it,—conscious of the swarming millions with their problems and desires. The son of a man in banking and wealthy, he was almost as obscure as if he had been poor, for he was outside the aristocracy of birth, outside the established church, outside every thing that claims distinction in social and intellectual life in England. Where many men of sensitive imagination see only confusion and discouragement in such a hive of commercial activity, Browning saw hope and order. An optimist, he believed in the enthronement of man above time and circumstance. And this he taught in his earliest poems, *Pauline* and *Paracelsus*. At 33 he won an audience with *Pippa Passes*. The pretty little silk-winder of Asolo, with her simple faith and happy heart expressed in song, triumphed over the snarls of sin and selfishness. All the world understood her "God's in His heaven; all's right with the world." Browning wrote other things as simple as that, like *The Pied Piper of Hamelin*, *Hervé Riel*, *How They Brought the Good News from Ghent to Aix* and *Home Thoughts*. *Saul* is one long, sustained drama of optimism in a royal setting; *Bells and Pomegranates* and *Men and Women* contain matchless lyrics, sensuous, impassioned, dramatic.

The most tender of all Browning's poems were addressed to his wife, Elizabeth Barrett Browning, herself a poet of distinction. Their brief life together in Italy is one of the world's most precious love stories. He outlived her 28 years and wrote his greatest work, *The Ring and the Book*, after her death. The last poem he wrote expressed the belief that he should "clasp thee again, O thou soul of my soul, and with God be the rest." He died in Venice December 12, 1889, and was buried in Westminster Abbey, London. Professor Edward Dowden, one of his biographers says: "Much of Browning's work, as much of Wordsworth's, is below what is characteristic. Those things will survive that are inspired by the permanent passions and endearing interests of humanity." William Sharp says: "It is as a poet that he will live, not as a novel thinker in verse. He had an enormous influence on the spiritual and mental life of his day, an influence that continually shapes itself to wise and beautiful issues." See *Life and Works* by Prof. Edward Dowden and *The Poetry of Robert Browning* by Rev. Stopford Brooke.

**Browns'ville, Texas,** a city, the county-seat of Cameron County and a port of entry, situated on the Rio Grande River, opposite Matamoros, Mexico. Brownsville was settled in 1848, and five years later incorporated as a city. It is in a busy stock-raising district, and has a large trade with Mexico. The region in which the city is situated was, after the year 1845, claimed by the Mexicans. This helped to bring on war with the United States, our government stationing a garrison at Fort Brown, adjoining the city, throughout the duration of the rupture with Mexico. Four miles from Brownsville the battle of Resaca de la Palma was fought in May, 1846, the issue being the flight of the Mexicans in a state of panic. In September, 1859, a Mexican raiding party captured Brownsville, but it was recovered by General Banks in November, 1863. The city has grown since, and to-day has some fine public buildings, including the county court-house, United States custom-house, a Roman Catholic cathedral, college and convent. Population, 13,163.

**Bruce, James** (born 1730, died 1794), a famous Scottish traveler, called the Abyssinian, early gave up business to travel through Europe. In 1768 he went to Algiers as consul-general, and there studied the oriental languages and also the art of medicine. He traveled through Tunis and Tripoli, studied at Aleppo in Syria, spent some time at Alexandria, and finally set out from Cairo on foot to explore the headwaters of the Nile. In November, 1770, he reached the sources of the Abawi, then supposed to be the main stream of the Nile. He spent about two years in Abyssinia,

and afterward returned to Alexandria by way of Senaar and the desert of Assuan. He published so many strange things about the manners and customs of the Abyssinians, that they were not believed at the time; but recent explorations have proved their truth. His *Travels to Discover the Sources of the Nile* was published in 1790.

**Bruce, Robert,** the most heroic of the Scottish kings, son of the Earl of Carrick, was born July 11, 1274. One of the several claimants to the throne of Scotland, Bruce at first took no part in the struggles of William Wallace to free his country from the English power. At last, however, he joined the final rising against the English king, Edward I, beginning his career by the murder of the Red Comyn, one of his rivals, in a fit of passion, because he suspected him of betraying their plans. He laid claim to the throne and was crowned king, but for many years he was an outlaw in his own kingdom, taking refuge in the fastnesses of the mountains, and hiding at one time in an island off the coast of Ireland, while he was thought to be dead. The story is told of him that one day, while lying in bed in a wretched hut, he saw a spider trying to spin its web from beam to beam over his head. Six times it tried and failed, just as many times as Bruce had been beaten by the English. "If the spider tries again," he thought, "so will I." The spider tried once more, and was at last successful. So Bruce determined to try again. He landed once more in Scotland, won several victories, and the death of the energetic Edward I, and the accession of his unwarlike son gave him a chance to recover his lost ground. He won back one castle after another, and at last the great battle of Bannockburn, which was to decide the liberty of Scotland, was fought June 24, 1314. The Scotch spent the night before the battle in fasting, and in the morning Bruce opened the battle by a single combat with a powerful English knight. His victory fired the hearts of his men, and, although less than a third the number of their enemies, they utterly routed them. Later he attacked the English on their own ground and compelled them to recognize him as lawful king of an independent Scotland. He died in 1329, at the age of 55, of leprosy. James Douglas tried to carry his heart to Jerusalem and bury it there, as King Robert had requested, but was killed in Spain while fighting against the Moors. The heart was brought back to Scotland and buried in the monastery of Melrose. The king's body was buried in the abbey church of Dunfermline, where his bones were discovered in 1818, when the foundations were being cleared out for a new church. His son, David II, succeeded him.

**Bruchesi, The Most Reverend Louis Paul Napoleon,** Archbishop of Montreal, born in Montreal in 1855. Studied theology in Paris and Rome. Ordained in Rome in 1878. Became a professor in Laval University. For years chairman of the Catholic school-board of Montreal. Appointed archbishop in 1897.

**Bruges** (*brŭ'jĕz*—Fr. *brüzh*), a city of Belgium, capital of West Flanders, is situated about eight miles from the sea, with which it is connected by three canals. Named from its many bridges, it is famous more for its ancient prominence than for its present prosperity. It dates from the 3rd century, and in the 12th century it was the center of the world's traffic. Commercial agents from seventeen kingdoms resided here, and no less than twenty ministers from foreign courts had mansions within its walls. At this period its population numbered upward of 200,000. Political troubles and religious persecutions subsequently ruined its prosperity. Many of its traders and manufacturers settled in England, and it is only during the present century that its greatness has begun to return. Its population is now about 54,015. It has a number of manufactures of lace, woolens, etc. Among its buildings is Les Halles, a market, with a famous belfry, 353 feet high, and possessing a chime of forty-eight bells regarded as the finest in Europe. Longfellow's poem has made this belfry well known. The church of Notre Dame has a spire 442 feet high and many valuable paintings, carvings and statues. Caxton, the famous printer, lived thirty-five years in Bruges.

**Brumaire** (*brŭ'mâr*), (meaning, foggy winter month—November), **The Eighteenth,** in the year VII, according to the calendar of the French Revolution, was a day famous in French history. It corresponds to November 9, 1799. On that day was begun the movement which overthrew the government of the Directory, which had been set up five years before, and made Napoleon Bonaparte first consul and finally emperor of France.

**Brunelleschi** (*brōō'nĕl-lâs'kê*), **Filippo,** (born 1377, died 1446), one of the greatest Italian architects, was a native of Florence. His most famous work is the dome of the cathedral of Santa Maria dei Fiori at Florence. It is the largest dome in the world, and was used by Michael Angelo as a model for that of St. Peter's. He made the designs for the Pitti Palace, which gave rise to the beautiful style of Tuscan palace architecture in the 15th century.

**Brunhilde.** — See NIBELUNGENLIED.

**Brunn** (*brŭn*), a city of the Austrian empire, capital of Moravia, stands at the junction of the Schwarzawa and the Zwittawa. Though its appearance is in many respects like an ancient city, yet it has numerous modern improvements. The state theater, opened in 1882, was the first theater

on the continent lighted by electricity. As a manufacturing town, its wools are especially famous. Back of the city, on a height of 984 feet, rises the castle of Spielberg, where the unfortunate Italian author, Silvio Pellico, was imprisoned from 1822 to 1830. The population numbers 109,346, almost half of whom are Czechs.

**Bru'no, Giordano,** an Italian philosopher who lived during the last half of the 16th century. Concerning his parents and the date of his birth almost nothing is known. His life was spent largely in lecturing in many of the principal cities of western Europe, including Padua, Geneva, Paris, London, Oxford, Wittenberg, Prague. His chief service lies in the energetic and successful war which he waged against the scholasticism of his times, and in particular against the lifeless physics of Aristotle.

A contemporary of Tycho Brahe and Kepler, he expanded the system of Copernicus and prepared the way for Galileo. Even from these few lines, it will be evident that he was just the type of man which the Inquisition was looking for. At the hands of this institution he received the verdict of "guilty," in February of 1600. Punishment was prescribed in the following customary hypocritical sentence: *Ut quam clementissime, et citra sanguinis effusionem puniretur,* "to be punished with the utmost clemency and without shedding of blood." He was accordingly burned at the stake in Rome on the 17th of February, 1600.

**Bruns'wick, Duchy of,** a state of northern Germany, made up of three larger and five smaller distinct parts. Its total area is 1,424 square miles, considerably larger than Rhode Island, and its population is 485,958, most of whom are Saxons and belong mainly to the Lutheran church. The country is rich in minerals, and agriculture is the chief occupation of the people. The capital is the city of Brunswick, population, 136,397. Brunswick was a part of Saxony under Charlemagne, but in 1235 it became a duchy. It now holds the ninth place among the states of the German empire.

**Brunswick, Ga.,** a city, the county seat of Glynn County, in the southeast part of the State, on St. Simon's Sound, about nine miles from the Atlantic, with a commodious and safe harbor. It is reached by the Southern Railroad, the Plant System and the Seaboard Air Line, and lies about 90 miles south-southwest of Savannah. It is also reached by steamships plying from Boston and New York. The place was settled early in the 18th century by James Oglethorpe, and is a favorite summer and winter resort, made attractive by its historic interests and many attractions, including St. Simon's Island, Cumberland Island (where sleeps Light-Horse Harry Lee), the Carnegie Dungeness Castle and the Jekyl Island Club. Its exports embrace oysters (canned), vegetables (also canned), besides cotton, phosphates, tar, rosin, turpentine and pine lumber. Population, 10,182.

**Bruns'wick, Germany,** the capital of the duchy of Brunswick, is situated on the Ocker, 143 miles southwest of Berlin. Founded in the 9th century by Bruno, duke of Saxony, it was enlarged by Henry the Lion and became an important member of the Hanseatic League. It has annual fairs of some importance and a large trade. The ducal palace is a fine modern building, and there are a number of picturesque old structures. The museum is valuable. Population, 143,534.

**Brunswick, Me.,** a town in Cumberland County, at the head of navigation on the Androscoggin River and on the Maine Central Railroad, opposite Topsham, and nine miles west of Bath. It possesses good water-power for its many manufactures, which include cotton goods, wood pulp, flour, wooden-ware, etc. Bowdoin College is located there. The town was settled early in the 17th century. In early times it was known as Pejepscot, a local history of the region being published at Boston in 1878. Population, 6,621.

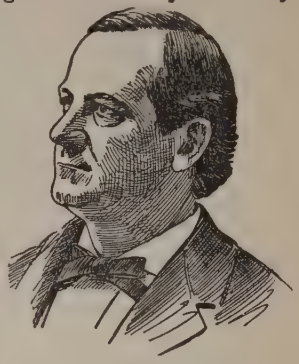
**Brussels** (*brŭs'sĕlz*), the capital of Belgium and one of the finest cities in Europe, lies on the River Senne. Railroads connect it with the principal towns of Belgium and with France, Germany, and Holland. The lower town, although it contains some fine old churches and some specimens of Gothic architecture, is mostly given up to trade. The upper town is the newest part of the city, and has the finest residences and public buildings, including the king's palace, the chief hotels, residences of foreign ministers, etc. The new palace of justice is a magnificent structure. The old city-walls have been turned into boulevards, and there are a number of noteworthy squares or places, as they are called, such as the Place Royale, with a colossal monument of Godfrey of Bouillon; the Grand Place, where in the 16th century the patriot counts, Egmont and Horn, were beheaded by order of the Spanish Duke of Alva; and the Place of Martyrs, where a memorial has been built to those who fell in the revolution of 1830, by which Belgium became independent. A picture gallery, museum and public library are contained in the Palace of the Fine Arts, and there are a large university and several academies. Besides being the seat of government, Brussels is one of the chief centers of the industry of the country. Its lace is particularly famous; but of the so-called Brussels carpets, only a few are made here, the larger part being man-

ufactured at Tournai. A great world-exhibition was held here in 1888. The population, with the suburbs, in 1910 was 665,806.

**Bru'tus, Lucius Junius,** a Roman patriot, who lived about 500 years B. C. According to the old story, he was the nephew of King Tarquin the Proud, and, to escape the fate of his father and brothers, who had been put to death by the king, he feigned stupidity, from which he got his name Brutus. He once went with the sons of Tarquin on a mission to the oracle at Delphi and when they were told that the one who first kissed his mother should rule, Brutus, as he landed in Italy, pretended to stumble and kissed the earth, the common mother of all. The treatment which the noble Lucretia received from the son of the king was the signal for a rising to throw off the kingly yoke, and Brutus, laying aside his mask, led the people in an insurrection which put an end to the monarchy. Brutus was chosen one of the first consuls, and when his sons took part in a plot to bring back the Tarquins, he condemned them to be scourged and beheaded, and saw the sentence executed. He was finally killed in battle against the enemies of his country's liberty. A public funeral was voted, the women wore mourning for a year, and a brazen statue, with a drawn sword in its hand, was raised to his memory.

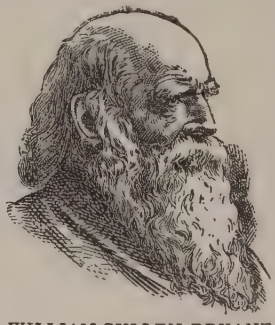
**Bru'tus, Marcus Junius,** one of the assassins of Cæsar, was born in 85 B. C., and died 42 B. C. He joined Pompey in his war against Cæsar; but after Pompey's defeat he was kindly treated by Cæsar, and made governor of Cisalpine Gaul. In 44 B. C., in his eagerness to preserve the liberty of the republic against Cæsar's apparent purpose of being made emperor, he was persuaded by Caius Cassius to join a conspiracy, and helped in his assassination, although Cæsar had given him many honors and promised him others. The people, instead of rejoicing at Cæsar's death, were enraged, and Brutus fled from Rome. Soon after, he and Cassius were defeated at Philippi by Antony and Octavius. He at once flung himself upon his sword and died. He was an earnest student, and something of a philosopher.

**Bry'an, William Jennings,** was born at Salem, Ill., March 19, 1860. He graduated from Illinois College in 1881, studied law at Chicago, and began practice in Jacksonville, Ill. In 1887 he removed to Lincoln, Neb. In 1890 he was elected to Congress, and was re-elected in 1892. Here he took position as a strong debater and brilliant orator. In 1896 he was nominated for the presidency by the Democratic party, on a free-silver platform, but, after a hard contest, was defeated by William McKinley, the nominee of the Republican party. In 1900 he was again the standard bearer of his party, and was again defeated by McKinley. In 1908 he again led his party, in opposition to Taft, but was defeated. In 1913 he was appointed secretary of state but resigned in 1915 owing to disagreement with President Wilson in a dispute with Germany as to neutral rights arising out of the use of submarines.



WILLIAM J. BRYAN

**Bryant, William Cullen,** a celebrated American poet, was born at Cummington, Mass., November 3, 1794. He began to write poetry when he was but ten years old, and in his fourteenth year his friends had published two of his poems, which were so popular that a second edition was called for. He entered Williams College in 1810, where he stayed two years, after which he began the study of law, and was admitted to the bar in 1815. His well-known poem, *Thanatopsis,* was written when he was 18 years old. He practiced law for a short period at Plainfield and then at Great Barrington. In 1817 he began to write for the *North American Review,* which brought him into public notice; and in 1821 his reputation was greatly increased by the publication of a volume of poems. He went to New York in 1825 and engaged in editorial work, and the next year became connected with the *Evening Post,* becoming chief editor a short time after. In 1832 a complete edition of his poems was printed, which made his reputation in England as great as it already was in America. He visited Europe several times, and studied the language and literature of several countries. The volume, *Letters of a Traveler,* was written soon after his return from one of these trips, and his letters to the *Evening Post,* afterward collected under the title, *Letters from Spain and Other Countries,* were written during another journey. In 1863 a small volume of new poems was published, and in 1870 and 1871 appeared



WILLIAM CULLEN BRYANT

his translation of Homer's *Iliad* and *Odyssey*, in English blank verse. He was often called on for addresses, and a volume of his *Addresses and Orations* was issued in 1873. He died at New York, June 12, 1878. His poems are noted for their delicacy yet vigor of expression, for their beautiful interpretation of nature and for their depth of thought.

**Bryce** (*brīs*), **Rev. George,** is head of he faculty of the University of Manitoba, lecturer there in biology and geology, and a professor in Manitoba College. He was born at Mount Pleasant, Brantford, Ont., April 22, 1844, and was educated at the Brantford high-school, the University of Toronto and at Knox College in Toronto, taking many prizes and medals during his course, and becoming examiner in natural history in the University in 1870. In 1871 the general assembly of the Presbyterian Church in Canada selected him to proceed to Manitoba and there organize a church and college. He thereupon organized Manitoba College in 1871, Knox Church in 1872, was one of the founders of the University of Manitoba in 1877, and was moderator of the general assembly of the Presbyterian Church in Canada in 1902–3. More than sixty churches have been opened in Manitoba through the influence of the Rev. Mr. Bryce, who, in addition to many magazine articles, has published *Manitoba, Infancy, Progress, and Present Condition* (1882), *Short History of the Canadian People* (1887), *The Apostle of Red River* (1898), *Remarkable History of the Hudson's Bay Company* (1900), and *Makers of Canada* (1903), this last a series of volumes.

**Bryce, Rt. Hon. James,** an English ex-member of Parliament, a Liberal in politics and a distinguished author, was born at Belfast, Ireland, in 1838, and educated at Glasgow and at Oxford. At the latter university he was appointed in 1870 regius professor of civil law, resigning the post in 1893. In 1880 he entered Parliament and six years later (while representing Aberdeen), he became under-secretary of state for foreign affairs in Mr. Gladstone's administration. He has been one of the chief supporters of Irish home-rule, and has also held the offices of chancellor of the Duchy of Lancaster and president of the board of trade. He was (1907-12) ambassador from Great Britain to the United States. He is a voluminous writer, his two most important works being *The Holy Roman Empire*, since become a classic, and his admirable and authoritative survey of *The American Commonwealth*. His other works embrace a narrative of a journey in Asiatic Russia, entitled *Transcaucasia and Ararat; Two Centuries of Irish History* (as editor); and an important book giving his *Impressions of South Africa*. Mr. Bryce has always taken a deep interest in Irish questions, in the extension of rural local government, in the reconstruction of the second chamber, in the development of secondary education and in the condition of the eastern Christians and their emancipation from Turkish misrule.

**Bryophytes** (*brī-ō-fī'tēz*), one of the four great divisions of the plant kingdom. It consists of two great classes, known commonly as liverworts and mosses. Of these two classes the liverworts are the more primitive, and have been derived very probably from the Green Algæ (*Chlorophyceæ*), and in turn have given rise to the mosses. In the *Bryophytes*, alternation of generations (which see) appears for the first time very distinctly. The gametophyte is the leafy plant upon which the antheridia and archegonia are borne. The egg developed within the archegonia is fertilized, and its germination produces the sporophyte, which in this case is a leafless structure, and is commonly known as the fruit of the moss. *Bryophytes* are distinguished from *Thallophytes*, the group below them in rank, not merely by the distinct alternation of generations, but also by the fact that they have a much more complex body and the female organ is always an archegonium. The group is also distinguished from the *Pteridophytes*, which are next above them, by the fact that the sporophyte is simply a leafless affair, and also by the fact that they have no vascular or woody system of tissues. See HEPATICÆ and MUSCI.

**Buccaneers,** the famous adventurers of the 16th and 17th centuries, who plundered the West Indies and the Spanish colonies of South America. They were mostly English and French, and were united by a common enmity against the Spaniards. Their first stronghold was on the little island of Tortugas; but later the French buccaneers established themselves in San Domingo and the English in Jamaica. They formed themselves into an association, with a code of laws. They went out in bands of fifty or more in boats, and attacked and plundered the Spanish ships as they returned from the colonies to Europe, loaded with treasure. Later on, they grew bolder and went in much larger numbers against fortified towns. The Frenchman, Montbars, named from his fierceness the exterminator, and the Welshman, Henry Morgan, were among the most famous leaders. The plundering of Vera Cruz and of Cartagena was among the most noted exploits of the buccaneers.

**Buchanan** (*bŭk-an'an*), **James,** fifteenth president of the United States, was born at Stony Batter, Pa., in 1791, his father having emigrated from Ireland in 1783. He was admitted to the bar in 1812, and soon obtained a fine practice. In 1821 he was

elected to Congress, and remained there ten years. In 1831 he was sent by President Jackson as minister to Russia, where he made the first commercial treaty between that country and the United States, which gave our merchants many valuable trading privileges on the Baltic and Black Seas. Two years later he was elected to the United States senate, of which he was a member for 12 years, until 1845. Here he was an active and able supporter of the doctrines and measures of the Democratic party, as well as a strong upholder of slavery and the rights of the separate states. When President Polk was elected, he made Buchanan secretary of state; and under President Pierce, he was appointed minister to England. In 1856 he was elected president. During his administration a Mormon rebellion in Utah was quietly settled. In the last year of his administration the trouble between the north and the south came to a head, and in December, 1860, South Carolina withdrew from the Union. The president declared that Congress had no power by the constitution to prevent any state from withdrawing if it wished and that the president could not treat with the representatives of any state, but must refer the matter to Congress. Soon afterward, Lincoln was elected president. Buchanan spent the remainder of his life at his home in Lancaster, Pa. In 1866 he wrote a book to defend his administration. He died in 1868.

JAMES BUCHANAN

**Buchanan, Robert,** an English poet, novelist, critic and literary free lance, was born in Staffordshire, England, in 1841, and educated at Glasgow University, Scotland. His early work appeared when he was a journalist and won him considerable fame, especially two volumes of verse entitled *Undertones* and *London Poems.* His other poetical writings include *A Lyrical Drama; The Drama of Kings; Ballads of Love, Life and Humor; The City of Dreams;* and *The Wandering Jew.* His chief novels are *A Child of Nature; God and the Man; Come Live with Me and be My Love;* and *The Shadow of the Sword.* He also wrote a bright *jeu d'esprit,* entitled *St. Abe and His Seven Wives.* He also issued a number of dramas and popular plays. His biting pen, as a critic and essayist, made him many enemies; though the good in him, on the other hand, won him many warm friends. He died June 10, 1901.

ROBERT BUCHANAN

**Bucharest** (*bōō'kȧ-rest'*), the capital and seat of government of the kingdom of Rumania, which, since 1861, includes the now united principalities of Wallachia and Moldavia, stands on the plain of the small river, Dambovitza. The city has a number of handsome buildings. A university is situated here, and there is a large trade centering in Bucharest between Austria and the Balkan Peninsula. There is an unusual number of cafés and gambling houses; and the presence of all the vices and few of the refinements of Paris has given Bucharest the reputation of being the most wicked capital in Europe. The city has been the scene of many military operations, and has suffered from floods, earthquakes and pestilences. The population is 300,000.

**Buck, Dudley,** an American organist and composer, who has achieved fame for his song music, operettas and fine organ compositions, was born at Hartford, Conn., March 10, 1839, and received his professional education at the Leipsic Conservatory of Music. For several years he was organist at the Music Hall, Boston, and latterly organist of Holy Trinity Church, Brooklyn and director of the Apollo Club. He wrote a number of admired songs, cantatas and festival hymns, besides several long compositions, especially his *Golden Legend,* based on Longfellow's well-known poem with that title. He died Oct. 6, 1909.

**Buckeye** (genus *Æsculus*), a group of trees distinguished by large winter buds; conspicuous flowers in pyramidal racemes; leaves large, compound and opposite; large nuts the fruit. In all the buckeyes the leaflets are branched at the end of the stem. There are eleven species, four native to this country. One very well known is the Ohio buckeye, once so abundant in Ohio as to give the state the name Buckeye, and the tree the name Ohio. It is gradually becoming rare, the disagreeable odor exhaled by the bark counting strongly against it. The tree is also known as the fetid buckeye. It is found from Pennsylvania south to Alabama, west to Michigan and Oklahoma. The bitter nuts are not edible, and are poisonous to cattle. The wood is valued specially in the making of artificial limbs. The tree grows from 20, 40 to 70 feet high, has slender spreading branches, and in April and May bears small, pale yellow-green flowers.

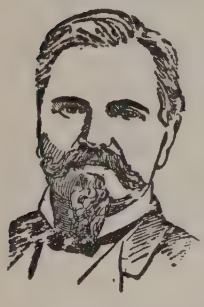
The sweet, yellow or big buckeye, has no disagreeable odor, and the nuts are eaten by cattle. It is a tall, shapely tree, and bears an abundance of showy yellow flowers. The tree grows along the Alleghanies, south to Georgia and west to Iowa.

The California buckeye grows along the western coast, is usually a small tree, and has a broad top. See Rogers: *The Tree Book;* Lounsberry: *A Guide to the Trees.*

**Buck'ingham, George Villiers, Duke of** (born 1592, died 1628), the son of an English nobleman, who rose to wealth and power under the Stuarts. He accompanied Charles I to Madrid in his unsuccessful suit for the hand of the Spanish princess, and made the arrangements for Charles's marriage with the Princess Henrietta of France. He involved England in war, and became very unpopular, but remained in high favor with the king. He was finally assassinated.

**Buck'land, William** (born 1784, died 1856), an English geologist, was lecturer for many years at Oxford on mineralogy and geology, and by his researches and writings did much for geology as a science. He practically founded the geological museum in Oxford. *Geology and Mineralogy, Considered with Reference to Natural Theology,* is one of his most popular works.

**Buck'ner, Simon Bolivar,** a Confederate general, was born in 1823 in Kentucky, graduated at West Point, and took part in the War with Mexico. He joined the southern army in the Civil War and became a major-general. After the war he settled in New Orleans. Returning to Kentucky, he was elected governor of that state in 1887, and in 1896 was vice-presidential nominee of the sound-money Democrats. He died January 8, 1914.



SIMON B. BUCKNER

**Buck'wheat,** a kind of grain, believed to be a native of Asia, called by the French Saracen wheat. It grows on poor soils and matures quickly, but is destroyed by the least frost. Its flowering season lasts for a long time, so that it is impossible for all the seeds to be at the proper stage of development when it is reaped. The seeds furnish a white flour, from which gruel is made in Germany and in Poland, and breakfast cakes in America and in England. A dark, heavy bread is also made from it in France. The flowers are rich in honey, and so buckwheat is cultivated to feed bees. Another kind of buckwheat is called Siberian buckwheat, but it is of a poor quality.

**Bud,** a name applied in general to an undeveloped shoot in which the axis is not elongated and the leaves overlap one another. In general, buds may be distinguished as leaf buds, which continue the ordinary growth of the stem axis, and flower buds. In the former case, the bud disappears by the elongation of the axis and the separation of the leaves. In the latter case it disappears by the opening of the flower.

**Budapest** (*bōō'dà-pĕst*), the capital of Hungary, consisting of the now united cities of Buda and Pest, situated on both banks of the Danube. Within recent years the city has become one of the finest capitals of Europe, and its growth and enterprise resemble those of our western cities. The two parts are connected by a magnificent suspension bridge. Buda is built in the form of an amphitheater around a hill, which rises 485 feet above the sea and is crowned by a citadel and a royal palace. The Blocksburg promontory rises abruptly to a still greater height. On its top is a now useless citadel, and its sides are dotted with villas. Just out of Buda, in a little plain surrounded by high hills, are the well-known bitter-water springs, which have made the name of Hungary more famous, perhaps, than any other article of export. On the other side of the river, the ancient and inner part of Pest is surrounded by a series of boulevards; while others branch out from them in straight lines to the outer environs of the city. The finest street in Budapest, and one of the handsomest in Europe, is Andrássy Street, which is two miles long. It is divided into a central driveway, with sidewalks, narrower driveways next the sidewalks, and graveled riding courses between the central and outer driveways. It connects the inner city with a beautiful park of 1,000 acres. The Margaretta island, which lies in the Danube, at the upper end of the city, two miles long and a half mile wide, is also kept as a pleasure ground. The river is lined for three miles with stone quays, leading up to promenades, along which are rows of fine buildings, broken by open parks and adorned with statues of Hungarian heroes. The city government controls many institutions which in the United States are under private companies, such as theaters, opera houses, street railways, etc. The university and special schools, the national museum, the 250 periodicals and a dozen or more daily papers published in the city are among the literary advantages of the place. All the Hungarian railroads center in Budapest, and its trade by the Danube is extensive. Next to Minneapolis, on this continent, it is the great milling center of the world. Total population (1910), 880,371.

**Buddha** (*bōōd'dȧ*), the founder of the religion known as Buddhism. Although this religion has now existed for 2,500 years, and its followers are counted as more than 340,000,000, or nearly one fourth of the human race, it is only within recent years that the discovery and study of Buddhist sacred books has made known to western nations the nature and birth of this world-religion. It began about the beginning of the 6th century B. C., in the north of Hindustan. Buddha, the founder, was a prince named Siddhartha; but he is often called Sakya and Gautama. Buddha, or more properly the Buddha, is the title given him in his state of perfection, and means the Enlightened One or he to whom truth is known. This prince, as the story runs, was of a thoughtful disposition, and his father, fearing that he would desert his high position and take to a religious life, had him married to a charming princess and surrounded him with all the splendors of a luxurious court. He was, however, in spite of his surroundings, constantly brooding over the thought of old age, of loathsome sickness and death and of the unknown future after death. After twelve years passed thus, he escaped from the palace and began a strict religious life. He was now about thirty years old. He cut off his long locks, the sign of his high caste, and studied all that the Brahmans could teach him, but found no satisfaction. He sat thinking for weeks, and at last came to the conclusion that ignorance is the cause of all evil and that by getting rid of ignorance, we can be free from all miseries. After various stages of thought, he himself became free from ignorance, and attained the "perfect wisdom" of the Buddha. He began to preach this strange gospel at Benares, and for forty years traveled over northern India, making many converts. He died at Kusinagara, at the age of eighty, in the year 472 B. C.

Buddhism has now little hold in India, the land of its birth; but it has full sway in Ceylon and over the whole Indo-Chinese peninsula; it prevails in China and to some extent in Japan; it is the religion of Tibet, of the Mongolian population of central Asia and southern Siberia and of the Tartar tribes on the lower Volga. As a system of belief, Buddhism holds that existence is on the whole a curse, and so it seeks final rest, in what is called Nirvana or nothingness—non-existence. Death, however, does not bring this rest, for it leads only to another state of existence, as a person, a spirit, an animal, an insect, a plant or even an inanimate thing, according to the merit or demerit of the departed. The Nirvana is gained by eight things: right faith, right judgment, right language, right purpose, right practice, right obedience, right memory and right meditation. There are many moral precepts and directions and certain virtues which lead directly to it. The great virtue of the religion is benevolence. Buddhism knows no supreme God or Creator, and as an intellectual belief is of little value; but as a system of morals it ranks only second to Christianity. Since the time of its founder its worship has been disfigured by countless extravagant and childish forms and ceremonials.

**Buell** (*bū'el*), **Don Carlos,** an American general, was born near Marietta, O., in 1818. He graduated at West Point in 1841 and took part in several battles in the Mexican War, being severely wounded at Churubusco. From the era of the Mexican to that of the Civil War, he was assistant adjutant-general in different departments. After the outbreak of the Civil War, he helped for a time in organizing the army at Washington; then became commander of the department of the Ohio, and later was made major-general of volunteers. At the battle of Shiloh his forces came to the aid of General Grant, and with their help the Confederates were defeated on the second day of the battle. A few months later he was given command of the new district of the Ohio. The Confederate force under General Bragg entered Kentucky and threatened Louisville and Cincinnati. A part of this force was met by a part of Buell's army at Perryville, October 8, 1862, and an indecisive battle was fought, Buell allowing the Confederates to retreat without attempting to follow them. His command was given to General Rosecrans in the same month, and a court of inquiry was ordered to investigate his conduct, but he was acquitted. He became president of the Green River Iron Works, in Kentucky, in 1865, and died on November 19, 1898.

GENERAL BUELL

**Buena Vista** (*bwā'nȧ vĕs'tȧ* or *bū'nȧ vĭs'tȧ*), a village in Mexico, near which the American forces under General Taylor defeated the Mexicans under General Santa Anna, on February 23, 1847. Taylor had a force of 5,000 men and Santa Anna had 20,000. The American forces occupied a position which made it almost impossible for the Mexicans to make use of their artillery or cavalry. Slight skirmishes took place on February 22; but the main attack by the Mexicans began the following morning and lasted the whole day, Santa Anna being finally driven back and retreating during the night. The American

loss was 746; that of the Mexicans being 2,000.

**Buenos Ayres** (*bō'nŭs ā'rĭz*, Sp. pron. *bwā'nôs ī'rās*), the federal capital of the Argentine Republic, stands on the right bank of the River Plata, 150 miles from the open sea. The river here is 36 miles across, but very shallow, a difficulty which is being remedied by a vast system of harbor works. Besides the coast and foreign trade, there is a large overland traffic to Chile. The absence of any good fuel near at hand and of stones and timber for building purposes, has been a great disadvantage to the city. It is, however, being greatly built up, in modern style, and has a number of fine buildings, among them one of the finest cathedrals in South America. The six railroads, also, which have their termini here, have many of them handsome depots. There are also a university and a military college; while its extensive mileage of street railroad lines and an extensive telephone system are among recent improvements. Europe and the United States are connected with the city by cable. Buenos Ayres was founded in 1535, but was twice destroyed by the Indians. It became independent of Spain in 1810. The commerce of the country, which passes through the ports of Buenos Ayres and Montivideo, consists chiefly of wheat and other grains, mutton, sheep-skins, wool, tallow and stearine. Its population (estimated 1911), 1,319,747; population of the province of this name, 1,796,320; area, 117,777 square miles.

**Buffalo.** Two kinds of cattle—the Asiatic buffalo and the Cape buffalo—properly receive this name. The Asiatic form is a native of India; it has been domesticated and carried into Greece, Italy and Egypt. It is larger and more powerful than an ox. It is fond of water, and will stand for hours with only its head above the surface. The Cape buffalo is found in Central and South Africa. It grazes chiefly at night, and lies in the woods and thickets during the day. It has never been domesticated. It is very fierce and cunning, and often attacks without provocation. Its skin is so tough that it is made into shields by the Kaffirs. The so-called American buffalo is the bison (which see).

1. Head of Cape Buffalo
2. Head of Indian Buffalo

A faithful bird-friend it has, the buffalo-bird, which closely attends it, picks parasites from its hide, and gives note of alarm at the approach of danger. The Indian or water-buffalo is of great service, owing to his strength and his ability to labor in wet grounds. It is a very interesting sight to see this huge creature at work in the rice fields, his head always low down, nose thrust far in front. There are still some wild herds to be found of the Indian buffalo, the largest of all wild cattle, a very dangerous animal, able to worst a tiger in combat. The so-called American buffalo is the bison. (See BISON.)

**Buf'falo,** a western city of New York state, at the eastern end of Lake Erie, at the head of Niagara River. It has 37 miles of water frontage, 12 miles of which are on Buffalo River and the remainder is on the outer harbor along the lake front and on Niagara River. It has one of the best harbors on the lake, formed by the Buffalo River, the entrance being protected by an immense breakwater, 4,000 feet in length. A new harbor has also been made by the building of a breakwater in the Niagara River. The city is a desirable place of residence, especially in summer, during which the lake breezes moderate the temperature. It has a beautiful series of parks connected by broad driveways. It has nearly 200 churches and many fine public and business buildings. Its railway facilities are great, while it has the advantage of the trade of the Barge Canal. Its commerce has grown wonderfully in recent years, and it is now the fourth shipping city in the New World. The first grain elevator on the lakes was built here, and it now has 22 elevators with 25,350,000 bushels' capacity. It has 2,200 manufactories, and handles great quantities of flour, lumber, coal and mineral ores. It is supplied with natural gas, piped from Pennsylvania and from Canada, and with electric power from Niagara Falls tunnel. It has over 375 miles of street-railway and 376 miles of paved streets, including 250 miles of asphalt thoroughfares. Pure water is supplied from Lake Erie. There are a good system of public schools and several colleges and seminaries, as well as public and private libraries. The town was burned in the War of 1812 by the British and Indians. In 1901 Buffalo was the seat of the Pan-American Exposition, and the mecca for travelers and sight seers from Europe and all parts of the New World. It was here (on September 6, 1901), that President McKinley was assassinated by an anarchist. Population, 454,112.

**Buffalo-Berry,** a shrub with small silvery leaves, which bears red or yellow fruit the size of a currant. It is sometimes planted as an ornamental shrub. It is a native of cold, dry regions of northwestern North America.

**Buffalo Bill.** See CODY, WILLIAM FREDERICK.

**Buffalo-Fish,** a dark colored fish with humped back and large head, found in the

Mississippi valley. It is one of the suckers, and the flesh is poor.

**Buffalo-Gnat,** a rival to the mosquito in bloodthirstiness, a dreaded enemy of man and beast, that ravages in the Mississippi and Missouri valleys. These gnats kill poultry and domestic animals. Their bite is poisonous and, attacking as they do in droves, causes much loss of blood. They fly and bite in the day time. The larvæ are aquatic, found on rocks and logs in swift streams.

**Buffalo-Grass,** a highly valued grass common in the West, from Manitoba to Texas. It is low and spreading, spreads rapidly by runners, is easily propagated and is adapted to regions of little rainfall. All stock enjoy it.

**Buffalo-Moth.** See CARPET BEETLE.

**Buffon** (*bŭf'fŭn*, Fr. *bŭf'fôn*), **Georges Louis Leclerc, Count de,** a French scientist (born 1707, died 1788). He was of a wealthy family and educated for the law; but, after traveling for a time, decided to devote himself to science. In 1739 he was elected a member of the Academy of Sciences, and appointed director of the Royal Garden. This gave him opportunity to study animals widely. His *Natural History*, in fifteen volumes, is written in the finest literary style and created a great popular interest in natural history. Rosseau is said to have kissed the steps of the pavilion in which the book was written. He was a great thinker and one of the pioneers in the modern doctrine of evolution. *The History of Birds*, *The History of Minerals* and *Epochs of Nature* are other works of his which are well-known.

**Building-Material.** In the mammoth structures which our modern building era has made us all familiar with, more important than ever is the necessity of having good sound material for their erection, so as to withstand the severe strain now imposed upon all departments of the builder's and constructor's work. In earlier times the erection of buildings was for the most part a matter of mere masonry, calling into exercise, in addition to the architect, the bricklayer's or stonemason's work; to-day, in this era of immense steel structures, the demands are more extensive and complicated, calling not only for materials of greater strength and endurance, as well as for increased fireproof protection, but also for elaborate plumbing, heating and ventilating arrangements, and for stone, granite, concrete or iron and steel that will resist crushing weights and defy deterioration by the changes in weather and temperature. So vast, and occasionally so elaborate, are the structures of our modern day that the building of them, under the architect's supervision, has to be undertaken not only by specialized labor, but let out to various contracting and sub-contracting firms, each responsible for its own assigned task, and turned out by the use of material either where the building is to be erected, or, more generally, in yards, workshops and factories where specialized work is made ready, as demand calls for, on a large scale, and that whether it be vaults, beams, joists, arches, balustrades, railings, baths, doors, windows, mantels, moldings, staircases, encaustic tiles, wardrobes, belts and belting, roofing material, boilers, radiators, furnaces, ranges, sinks and light and heating plant. When these rough essentials are furnished and placed, then come the plumbing, lathing and plastering operations, the fireproofing, glazing, painting, papering and general finishing and decorating,—the processes of all being well known, and the materials of which, including the skilled labor in using and applying them, should be of the best quality and the most workmanlike and satisfactory.

**Bulb.** In a certain sense a bulb is a bud whose leaves have become fleshy through storage of reserve food. This simply means that it is a shoot whose axis has remained short and whose overlapping leaves have become thickened. A further difference between a bud and bulb is that in the latter case it is not the whole leaf, which is thickened, but merely the leaf bases, as in the hyacinth and onion.

**Bul'bel,** bulbs which grow from the main bulb, or which are formed by the breaking apart of the main bulb. What is known as the potato-onion is an example of the latter phase.

**Bulb'let,** small bulbs which are borne in connection with the foliage or flowers. For example, "top onions" bear bulblets in the flower cluster, while the tiger lily bears bulblets in the axils of its leaves.

**Bulga'ria,** including Bulgaria proper, occupies a part of the Balkan Peninsula, and lies between the Danube and the Balkan Mountains, and, with Eastern Rumelia to the south, is a tributary principality of the Balkan Peninsula, under the Sultan of Turkey. On its eastern border is the Black Sea, on its western Servia; while it is bounded on the north by Rumania and on the south by Turkey.

*Natural Resources.* With a fine agricultural country, a broad seaboard, the fine waterway of the Danube on her northern boundary, a mild climate, one of the most liberal constitutions in Europe and an energetic people, Bulgaria has great possibilities.

*Occupations.* There is in Bulgaria considerable agricultural and cattle raising industry; also wine-making, tobacco growing and manufactures of silk and the attar of roses.

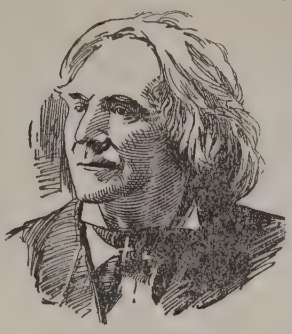
*Cities.* Sofia, the capital, has a population of 102,769. The other chief towns are Varna, 41,317, a fortress on the Black

Sea, Plevna, 23,081, and Rustchuk, 35,823. At Sofia there is a university, with 50 professors and about 800 students.

*History.* The present Bulgarians came in the 6th century from the banks of the Volga and overran the country. They gained power, and at one time ruled over Macedonia, Thessaly, Epirus and Albania; while their prince styled himself the autocrat of all the Bulgarians and Greeks, and looked forward to a great empire of Slavs. They fell, however, under the power of the Byzantine Empire and, later, under the Turks, lost all their civilization, and their warlike character seemed gone forever. But about the middle of the 19th century a national feeling began to stir again, and literature, newspapers, and schools grew up. The Bulgarian atrocities in 1876, in which many thousands of Christians were killed by their Turkish neighbors, aroused the interest of Europe in Bulgaria, and the next year Russia, as the assumed guardian of the Slavic races, made war against Turkey. By the treaty of Berlin, 1878, Bulgaria was made a self-governing state, but her choice of a ruler must be confirmed by Turkey and the powers of Europe. Prince Alexander of Battenberg, by the choice of the people, became Alexander I of Bulgaria in 1879, and in the following year Eastern Rumelia united with Bulgaria. A war with Servia followed, in which Bulgaria was completely successful, through the bravery and generalship of her prince, who became the idol of the people. Russia, however, grew hostile to him, and in the interest of Bulgaria he surrendered the throne. In 1887 Prince Ferdinand of Saxe-Coburg occupied the vacant throne. In 1908 Bulgaria proclaimed complete independence of Russia and Ferdinand assumed the title of Czar.

Eastern Rumelia is in many respects in advance of Bulgaria proper, as it has been longer open to influence. The production of attar of roses is one of its most valuable industries. Sofia and Philippopolis are the two capitals. The army consists of about 52,500 men, with a military college at Sofia. There is also a small fleet. The total area of Bulgaria, including both parts, is 38,080 square miles, or a little larger than Indiana, and the population of the whole principality is 4,329,108. Eastern Rumelia has a population of 1,174,535, with an area of 13,700 square miles. Philippopolis, the capital, has a population of 47,929.

**Bull, Ole Bornemann,** a Norwegian violinist (born 1810, died 1880). His father was greatly opposed to his studying music, but in 1829 he went to study under a musician in a German town. He became discouraged and proceeded to Göttingen to study law, but afterwards went to Paris where the celebrated violinist, Paganini, was present at his début. After a period of misfortune, he became famous as a player. He traveled through Italy, Great Britain, Russia, Germany and Norway, his reputation increasing all the time. In 1844 he came to America, and nine years later he made this country a second visit, playing to immense crowds and making a large fortune, most of which he lost in land-speculations. One of his land-schemes was the buying of a great tract in Pennsylvania, upon which he founded a Scandinavian colony, later called Oleana. The plan proved a failure, and the colony broke up. In 1869 he once more visited America. He died at Bergen, Norway, in 1880.



OLE BULL

**Bull-Dog,** a large-headed, strong-jawed variety of dog, of the mastiff type common in England, and used in olden days in boar-hunting and bull-baiting. Nowadays they are commonly reared as watch-dogs, or crossed with other breeds and their temper modified, as pets and faithful companions of man. In color the usual varieties are brindle, red, fawn, white or piebald; in weight they are about 50 pounds, compact in shape and thick-set. Other species include the toy bull-dog, and the French bull-dog, the latter familiar now in this country as a house dog of good disposition.

**Buller, General Sir Redvers,** V.C., a British officer in command of the Natal Force in the Boer War of 1899–1901, who, after many disheartening reverses, effected the relief of Ladysmith, and returned to England in November, 1900. He was born in England in 1840, and as an officer of the 60th Rifles saw much service in the China Expedition of 1860, in the Red River Rebellion (in northwestern Canada), in Ashanti and in the Kaffir and Zulu Wars in South Africa. In the war with the Boers, that broke out in October, 1899, he had chief command of the first army-corps sent from England to South Africa, and was conspicuous in the operations which led to the relief of Ladysmith. He died in England, June 2, 1908.

**Bull-Fight,** a Spanish amusement. It was introduced by the Moors and soon spread over all the kingdom. Each city has its arena, some very magnificent, called place of the bulls, for carrying on this sport. The bulls are let loose in the open space, one at a time. Horsemen begin the attack armed with lances, and if one of the horses is ripped up, as often happens, a crowd of

footmen with red banners take up the attention of the bull, while the rider escapes. Men armed with sharp, barbed darts, with fireworks and flags attached to them, next torment the victim. Finally the main actor enters the arena clad in black, and, armed with a long, straight sword, he soon ends the sport, driving his blade up to the hilt into the bull, where the neck joins the spine.

**Bulfinch, Thomas** (1796–1867), the author of the *Age of Fable* (1855), a remarkable and well-written book, and of many literary and historical studies, was a native of Boston, Mass. He was a student of Phillips Exeter Academy; and a graduate of Harvard University (1814). Mr. Bulfinch was a business man and banker as well as an author. Among his works are *Legends of Charlemagne, Poetry of the Age of Fable*, the *Hebrew Lyrical History*, the *Age of Chivalry, Oregon and Eldorado* and the *Boy Inventor*. Mr. Bulfinch was an intimate friend of the poet Longfellow.

**Bull Run,** a small stream in northeastern Virginia, upon whose banks were fought two severe battles of the Civil War, both of which resulted in defeat to the Federal arms. The first battle of Bull Run was fought July 21, 1861, and was the first important engagement of the war. The Union army, 35,000 strong, was commanded by General Irvin McDowell; the Confederate army, numbering about 32,000, was under General Beauregard. The fight began in the early morning, and until noon the advantage was with the Federal forces, which crossed Bull Run and attempted to turn the confederate left; but in the afternoon the Confederates were re-enforced, the Federal lines gave way before the onset of fresh troops, and finally retreated in confusion and disorder. The effect of this battle was greatly to encourage and strengthen the south, while the north proceeded to prepare for a struggle which it was now seen must be stubborn and prolonged. On the same field a second and terrible battle was fought on the 29th and 30th of August, 1862, between the Confederate army under General Lee and the Union forces under Major-General John Pope. After two days' hard fighting, Pope was defeated and compelled to retreat. He charged his defeat to the tardy support which was given him by certain divisions of McClellan's army, which had been sent to him, and particularly to positive disobedience of orders by General Fitz-John Porter, who withheld re-enforcements during the crisis of the battle. Porter was afterward courtmartialed and dismissed from the service, but was later on restored.

**Bülow** (*bü'lō*) **Prince Bernard von,** German imperial chancellor in succession to Prince Hohenlohe, who retired in 1900 and died in the following year. Prince von Bülow was born in 1849, in Holstein, studied at Lausanne, Leipsic and Berlin. served in the Franco-Prussian War, and entered the German Foreign Office in 1874. In his early diplomatic career he was successively secretary of legation at Rome, St. Petersburg, Vienna and Paris; charge d' affaires at Athens; and secretary at the Berlin Congress. In 1897 he was named Foreign Secretary at Berlin, and as such concluded with Spain the treaty by which Germany became possessor of the Mariana and Caroline Islands. In 1899 he was created a count and in 1900 became German Chancellor, after which he was raised to the dignity of a prince of the Empire, as well as prime minister of Prussia.

**Bülow** (*bü'lō*), **Hans Guido von,** a German musician, born at Dresden in 1830, and died February 12, 1894. He studied law for a time, but by the advice of Wagner and Liszt decided to devote himself to the study of music, which he did under Liszt for two years. In 1855 he was made professor of the piano in the Conservatory of Music at Berlin, and later went on concert tours through Germany and Russia, gaining a great reputation as a pianist. In 1867 he became chapel-master to the king of Bavaria at Munich, and in 1880 he was made director of music to the court at Meiningen. He wrote about thirty musical works, and composed many songs and short pieces. He was one of the most successful orchestra-leaders in Europe, and as a pianist had few equals. He died at Cairo, Egypt, on Feb. 12th, 1894.

**Bul'wer-Lyt'ton, Edward George Earle Lytton, Baron Lytton,** an English novelist, was born in Norfolk in 1803. He belonged to a very old English family, and was educated at Cambridge University. In 1826 he wrote his first poetry for publication, and in the next year his first novel, *Falkland*, appeared. After that his writings were published in rapid succession, among the earlier ones being *Eugene Aram, Pelham, Last Days of Pompeii, Rienzi the Last of the Tribunes, Zanoni* and *The Last of the Barons*. He was also successful in the writing of dramas, *Richelieu* and *The Lady of Lyons* being the best known. He entered Parliament in 1831 and became a prominent member, being made secretary of state for the colonies in Lord Derby's cabinet in 1858. Most of his later works were first published in magazines, of which the most celebrated are *The Caxtons, Harold the Last of the Saxon Kings, My Novel, A Strange Story* and *Caxtoniana*, the last being a collection of essays. Bulwer considered *King Arthur*, an epic poem, his best work. His novels are very popular and have been translated into several languages. He was made a peer and given the title Baron Lytton in 1866. His death occurred in 1873. Lord Lytton's son, Robert, inherited much of his father's gifts, especially as a poet. His best known work is *Lucile*,

published under the *nom de plume* of Owen Meredith. He is also known as a statesman and diplomat, having filled the offices of governor-general of India (1878–80) and of ambassador to France (1887–91). Lord Robert Lytton was born at London in 1831, and died at Paris in 1891.

**Bun'ker Hill,** an historic elevation in Charlestown, now a part of Boston, Mass. It is about 100 feet high, and is connected by a ridge with another smaller hill, called Breed's Hill. These hills are where the famous battle of Bunker Hill was fought between the British and American troops, June 17, 1775. The British had possession of Boston, and Generals Howe, Clinton and Burgoyne had just arrived from England with a large body of troops. The American militia and the volunteers were encamped at Cambridge, three miles from Boston. The news had come to the Americans that General Gage was planning to fortify Dorchester Heights, and in order to prevent this 1,000 men under Col. William Prescott were sent to Charlestown on the night of June 16 to fortify Bunker Hill. General Putnam and Major Brooks joined them, and after reaching Bunker Hill without attracting the attention of the British, it was decided to throw up the breastwork on Breed's Hill instead, as it was nearer Boston. At daybreak the British sailors on the ships anchored in the harbor, descried the fortification and began firing upon it. Prescott extended the fortification by filling up with hay the space between two old rail-fences on the left of the breastworks. General Warren came up about two o'clock in the afternoon, and, refusing the command, fought as a volunteer. At the same time Colonel Stark arrived with 500 men and took up a position behind the rail-fence. Meanwhile, the British forces, under Generals Howe and Pigot, had been brought over from Boston in boats, and at half-past two the first charge was made. Prescott had ordered his soldiers not to fire until the British were so near that the whites of their eyes could be seen; and when they did open fire the British retreated in confusion. Meanwhile the town of Charlestown had been set on fire by the shot from the British ships, and, under cover of the dense smoke, Howe ordered a second attack; but again his troops were driven back. Unfortunately the Americans were by this time almost out of ammunition, and when, Clinton having come over with British re-enforcements, a third assault was made, the Americans after firing their last shot and fighting the British bayonets with clubbed muskets were obliged to retreat. The British pursued them only a short distance. The loss of the British was 1,054; that of the Americans being only 450, though among them was General Warren. In the center of the old fortification at Breed's Hill now stands a granite monument, 221 feet in height. The corner stone was laid by Lafayette in 1825, at the fiftieth anniversary of the battle, Daniel Webster delivering one of his greatest orations. It was completed in 1842 and dedicated in the following year, Webster once more being the orator of the day.

**Bun'sen** (*bōōn'sen*), **Robert Wilhelm,** a distinguished German physicist and chemist, born at Göttingen, March 31, 1811. He received his university training at Göttingen, where he took his doctor's degree at the age of 20. His education was continued at Paris, Berlin and Vienna. At the age of 22 he began, with a privat-docentship at Göttingen, that marvelous career of teacher and investigator destined to extend over more than half a century and to make his name beloved by his own students and a household word for all others. The years from 1851 to 1899 were spent at the University of Heidelberg.

In addition to his more technical chemical investigations, the following may be mentioned as his most important contributions to science:

1. The invention of the Bunsen battery which replaced the expensive platinum plate of the Grove cell by a cheap carbon rod.
2. The invention of the Bunsen burner now in use everywhere from the kitchen to the research laboratory.
3. A satisfactory explanation of the phenomenon of the geyser, given after a trip to Iceland in 1847.
4. Precise methods for analyzing gases.
5. The chemical action of light.
6. His well-known ice-calorimeter for measuring quantities of heat.
7. His most important contribution, however, is that which he, in conjunction with Kirchoff, published in 1860 and 1861, namely, the establishment of the foundation of spectrum analysis. These two men showed that the prism is a reliable and delicate method for detecting the presence of any particular element in a chemical compound. And in their second paper they exemplified this fact by the discovery of two new elements, namely, *cæsium* and *rubidium.*

During the last ten years of his life Bunsen was not engaged in active teaching, but held an emeritus professorship at Heidelberg, where he died August 16, 1899.

**Bunting,** a group of birds between finches and starlings, containing numerous species widely distributed. Among these may be mentioned, as of special interest to our readers, the Snowflake, called Snow-Bunting; the Dickcissel or Black-Throated Bunting; Vesper Sparrow or Bay-Winged Bunting. And mention should be made of the Indigo Bunting, Painted, Varied, Beautiful and Lazuli Buntings. The Bunting is one of the few birds of the Arctics. See SNOWFLAKE AND DICKCISSEL.

**Bun'yan, John,** author of *The Pilgrim's Progress*, was born near Bedford, England, in 1628. His father was a tinker, and John was trained to that craft. He was very fond of dancing on the village green and of ringing the church bells—things he afterward thought sinful. He served in the army for some time during the English Civil War, though only 16 years old. After the war he married a poor girl and became deeply interested in religion. He began to preach to the poor people in the villages around Bedford, and, getting into discussions with the Quakers, in 1656 he published a book against them. It was a remarkable book for an uneducated craftsman to write. This led to further discussion and the publication of other works, Bunyan being finally arrested and imprisoned. He was in prison 12 years, though he was continually told that he would be set free if he would give up preaching; to which he replied: "If you let me go to-day, I will preach again to-morrow." He supported himself and his family while in prison by making lace, the remainder of his time being spent in reading the Bible, preaching to the other prisoners and writing religious papers and books. He finally was released in 1672, and preached for three years, after which he was again put in prison, but was let out again six months later. While he was in prison the second time he wrote *The Pilgrim's Progress*. He became pastor of the Bedford Church, where he remained 16 years, dying in 1688. *The Pilgrim's Progress* at once became very famous and has since been translated into nearly a hundred languages.

**Bur'bank, Luther,** the "PlantWizard," after four years of patient effort, developed the famous Burbank potato from small tubers of scanty yield when only a boy on the farm on which he was born near Lancaster, Massachusetts, in 1849. Although his achievement soon added $20,000,000 a year to the value of our potato crop, he sold his rights to a local seedsman for $150. Not long after, his health requiring outdoor life, he went to California, worked at odd jobs as a farm hand and finally saved enough to start a small nursery. When it was bringing him a profit of nearly $10,000 a year, he gave it up, against the protest of friends, and began the series of experiments on his farm at Santa Rosa which have given us not only the thornless, edible, fruit-bearing cactus, but a long list of other wonders of the plant world, including the crimson poppy, the Shasta daisy, a combination of plum and apricot called the plumcot, the white blackberry, new varieties of apples, pears and cherries, and a walnut tree that produces a wood like mahogany and of remarkably rapid growth. His thornless cactus is a forage plant showing great improvement in productiveness even over alfalfa. The fruit has a flavor between the raspberry and the pineapple, and will grow on the desert as well as the spiny variety. Thousands of acres have been planted, not only in this, but in almost every foreign country. Where alfalfa grows five to ten tons per acre, this cactus produces fifty to two hundred tons. The money derived by Mr. Burbank from the sale of improved varieties, considering the outlay required to produce them, has been small—from $100 to $500 each. Having disposed of the commercial department of his work he now gives his exclusive attention to producing improved varieties of trees, plants and flowers.

**Burdett-Coutts, Lady.** In 1814 there was born in Ramsburg, Wiltshire, England, a little girl named Angela, the daughter of Sir Thomas Burdett, a celebrated parliamentarian, and granddaughter of Thomas Coutts, a London banker. At the age of 22 she inherited a great fortune and became head of a banking firm that was second only to the Bank of England. People expected her to take a high place at the young queen's court and to marry a duke or prince. Instead she quietly set about the task of bringing light and hope to the swarming millions of East London. At a cost of $450,000 she built St. Stephen's Church, the first institutional church in the world. It combined the religious function with the social settlement. Other churches, schools, model tenements, scholarships in universities, evening schools, penny dinners for poor school children, a fishing school and fleet for famine-stricken west Ireland and a great market-house in the slums of East London, followed in rapid succession. Then plain Angela Burdett added her grandfather's name to her own and the Queen made her a baroness—the only woman of the people ever raised to the peerage in Great Britain. As Lady Burdett-Coutts, she secured the Children's Charter from Parliament, to protect children from cruelty; also a law to stop cruelty to animals. In a time of cholera she cleaned East London and forced new sanitary laws. She assisted starving Irish peasants to emigrate and carried on relief work in the Turko-Russian War. For 70 years she was the friend of the queen and of every celebrated man and woman of her time, from Charles Dickens to the Duke of Wellington. Walter Besant made her the heroine of his novel *All Sorts and Conditions of Men.* At the age of 68, she married her private secretary, Mr. Ashmead-Bartlett, who took her name and entered parliament to further her ideas of public good. She died in 1907 at the age of 93, universally mourned.

**Burgoyne** (*bûr-goin'*), **John,** an English general during the American Revolution. His surrender to the Americans, Oct. 7, 1777, at Saratoga, (*q. v.*) was one of the most important victories of the war. Entering the army as a subordinate he had risen by distinguished service in Portugal before being sent to America. On returning to England he wrote an account of

# SOME OF THE PLANT WIZARD'S WORK

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POTATO CAUSED TO GROW ON TOMATO VINE

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THESE WILD POTATOES ARE CROSSED WITH TAME POTATOES TO MAKE THEM HARDY

his American campaign in his own defense, throwing the blame for his failure on the British cabinet. He also wrote several dramas. He died at London in 1792.

**Bur'gundy** (*bûr'gŭn-dĭ*), the name, at different times, of three kingdoms, of a duchy and lastly of a French province. The first kingdom was formed about 406, by the Burgundians, a German people who crossed the Rhine and extended their dominion over the Saône and the Rhone. They were converted to Christianity in eight days. About 100 years later they were conquered by the Franks, but the country still kept its name. About 300 years later, when the Carlovingian Empire was broken up, two kingdoms were formed from a part of old Burgundy, and called Lower Burgundy and Upper Burgundy, which afterward were united and finally fell under the power of Germany. The remaining portion of old Burgundy meanwhile had become a powerful duchy of France. In the first family of the dukes of Burgundy there was a succession of twelve, who were among the most powerful princes of their time and were noted for their loyalty to the French kings. This family came to an end, and soon after the duchy was given by the French King John, to his son, Philip the Bold. This duke and his three successors, John the Fearless, Philip the Good and Charles the Bold, are among the most famous historical characters of their age. The last two had royal power, and owned, besides Burgundy, the Netherlands and several other countries. After the death of Charles the Bold, the duchy of Burgundy became a province of France. This province included the present departments of Côte-d'Or, Saône-et-Loire and Yonne, with parts of adjoining departments. Burgundy wines, which are famous, are produced in these departments and named after the old province.

**Burke, Edmund,** a British statesman and author, was born at Dublin, Ireland, in 1729.

EDMUND BURKE

He graduated at Dublin University, and proceeded to London to study law, but abandoned it for literary work. He wrote two works in 1756, the most famous of which is a study of the origin of our ideas of *The Sublime and the Beautiful.* Soon after he became acquainted with the celebrated Dr. Samuel Johnson, who said of him that "no man of sense could meet Mr. Burke by accident under a gateway, to avoid a shower, without being convinced that he was the first man in England." In 1765 he entered parliament, and at once became prominent because of his wide knowledge and learned speeches. In 1769 and 1770 he published two pamphlets which were widely read, called *The Present State of the Nation* and *Thoughts on the Cause of the Present Discontent.* He was a great student of American affairs, and his papers and speeches during the Revolutionary War made him unpopular with many people in England. At the same time he was greatly interested in English affairs in India, and led the trial of Warren Hastings for corrupt government in India. When the French Revolution broke out, Burke at first favored it; but when he saw the leaders were becoming lawless and violent, he opposed it. His *Reflections on the French Revolution* was the most popular paper on the subject written in England; but it separated him from his former political friends, who were strongly in favor of the Revolutionary party. He wrote many other papers, but left Parliament in 1794. He died in 1797. Burke was one of the most famous orators England ever had, and his writings are wonderful examples of beautiful English.

**Burlesques,** a class of literary or dramatic compositions of the nature of parody or travesty, which date from classic times, and have had a considerable vogue in Italy whence the term (from the word *burla* which means raillery, mockery or jesting) is derived. Burlesques have also been much written in France, in England and in this country, the design of their authors being to travesty some well-known work, or to present a subject in a humorous or even a ludicrous aspect and treating it in a light, playful, jocose manner. Ancient examples can be traced back to the era of Aristophanes and to Hipponax of Ephesus (6th century B. C.). the latter being deemed the father of burlesque poetry. Its modern examples are those found in Italian literature, in the writing especially of Berni and Gozzi, whose most successful imitators were Sarrazin and Scarron in France, Chaucer, Beaumont and Fletcher, Butler in his *Hudibras,* the brothers Horace and James Smith in their *Rejected Addresses.* In dramatic burlesques the most notable example is Molière in France, and of the lighter order, Burnand, W. S. Gilbert and Plandie in England. The *Gil Blas* of Le Sage and *Don Quixote* of Cervantes are renowned examples of burlesque. In England many instances of burlesque and diverting poetic effusion are to be met with in the poems of Thomas Hood, Praed, Cocker, Calverley and Dobson. In this country plentiful examples will be found in the writings of Dr. O. W. Holmes and in

our innumerable humorists and dialect writers.

**Burlingame** (*bûr'lĭn-gām*), **Anson,** an American statesman, born at New Berlin, New York, in 1820. He studied at the University of Michigan, and at the Harvard Law School, and began the practice of law in Boston. In 1853 he was elected to the senate of Massachusetts, and one year later to Congress, helping to form during the following year the new Republican party. In 1861 President Lincoln appointed him minister to China. In 1867 he intended to give up his position and return to America, but the regent of the Chinese Empire appointed him special Chinese ambassador to the United States and the countries of Europe, to make treaties between China and other nations. In July, 1868, he succeeded in getting new articles added to the old treaty between China and the United States, which gave the citizens of each country many privileges in the other, such as religious freedom and the right of founding schools. This is known as the Burlingame treaty. Mr. Burlingame then secured special treaties between most of the European powers and China, and was at St. Petersburg, negotiating a Chinese treaty with Russia, when he died in 1870.

**Bur'lington,** a city in Iowa, county seat of Des Moines County, on the west bank of the Mississippi. It is a beautiful and healthful city, the business portion being built along the river, while the residences are on high bluffs, from which there is a fine view up and down the river. The city has good public schools, including a $250,000 high school and a Roman Catholic Academy. Notable in the city are the municipal buildings, opera house and public library. Coal is extensively mined near the city, making it a favorable place for manufactures, among which there are flour and planing mills, foundries, soap factories, breweries and pork-packing establishments, agricultural tools, furniture, etc. Population 24,640.

**Bur'lington** (*bŭr'ling-ton*), **N. J.,** (formerly a port of entry) in the county of the same name, on the Delaware River, 19 miles northeast of Philadelphia and on the Pennsylvania Railroad. Here are situated Burlington College, and St Mary's (P. E.) Hall for Girls, and the town has an opera house and a good public library, besides churches and schools. Its industries embrace iron pipe, stove and carriage works, harness and shoe-making establishments, also canned goods, besides berrying and market gardening. The city owns and operates its own water-works, its charter as a city dating from 1851, with revision in 1868. Population, 8,336.

**Bur'lington, Vermont,** a city and port of entry in Chittenden County, Vermont, on Lake Champlain. It is the seat of the University of Vermont and State Agricultural College, of the Vermont Episcopal Institute, (for boys) and of Bishop Hopkins Hall (for girls). The Mary Fletcher Carnegie Library Building. The city has Fletcher Free Library now housed in a Carnegie Library Building. The city has an extensive trade in lumber and in the manufactured products of lumber, in stone and marble and in proprietary medicines. Good water-power is furnished by the Winooski River and large cotton and woolen mills are situated here.

The public schools of the city have an enviable reputation, the parochial schools are largely attended, and there are two commercial colleges. Burlington is the educational center for a wide region of country. It is noted for its beauty of situation, for its wide and well kept streets, for its handsome private residences and for its fine public buildings. It has a municipal electric lighting plant. Population, 20,468.

**Bur'ma,** the largest of all the provinces of the Indian Empire, lies between Tibet, China, Siam and the Bay of Bengal. It covers about 236,738 square miles, considerably more than California and South Dakota, while the total population is over 12,115,000. The old province of Lower Burma occupies about one third of the territory, and the new province of Upper Burma, with the Shan States about two thirds.

*Surface and Drainage.* The country is mostly hilly, largely covered with forests. Of the numerous mountain peaks, the highest reaches an elevation of 15,000 feet. The largest river is the Irawadi, flowing from its unknown source in the snows of Tibet, over a course of 1,100 miles to the Bay of Bengal. It is navigable all the year round for river steamers for 700 miles; and though there are now several railroads, most of the trade is carried on by the numerous rivers.

*Natural Resources.* Teak and bamboo are the most valuable of the forest products. An unusual wealth of wild beasts, serpents, birds and fishes found in India abounds here. The mineral yield of the soil is not noteworthy, except that from the ruby mines near the capital. The ruby-yielding region extends for about 200 square miles, and the rubies are the best in the world.

*People, Customs.* Besides foreigners, the people are mainly Burmans, Shans, Karens and other hill tribes. The Burmans are the largest class. Their chief food is rice, and they have, besides, fish or meat daily. They live well, but save little money. Most of the people live in modern houses or bamboo huts, but the pagodas or temples of masonry and the monasteries made of teak are more substantial buildings. The finest and most sacred pagoda in Burma is the Shway Dagon Pagoda at Rangoon.

*Products.* The chief crop of the country

is rice, the acreage of which in Upper and Lower Burma was, in 1904–05, 9,265,097 acres. Wheat, pulse, sugar-cane, cotton, tea and oil-seeds are also raised.

*Religion.* Their religion is chiefly Buddhism. The class which has the most influence and is most respected is the Buddhist monks, of whom there are 20,000, whose duty it is to set an example of a correct life and to instruct the young. The Shans are much like the Burmans, but are highlanders and great traders. The Karens used to be nature-worshippers; but now large numbers of them are Christians, through the influence of Baptist missions, which have been among the most successful of modern missions. Both the Burmans and the Shans have long had a written language, and there are now a number of native newspapers. A university and several technical schools are also established in Lower Burma.

*History.* The Burmans are believed to have come into the valley of the Irawadi about 2,000 years ago. Since that time various powerful Burman dynasties have risen, flourished and fallen. The Chinese have often invaded Burma from the north. The Burman power came into contact with the British in India as early as 1820, and, piece by piece, the British have been compelled to assume control over Burma. In 1885 King Thebaw declared war and tried to drive the British into the sea, but was overcome and carried a prisoner to India, and in 1886 the whole of Burma became a part of the British Indian Empire. It is governed by a commissioner on behalf of the viceroy of India. The capital of Upper Burma, Mandalay, has a population of 138,299; of Lower Burma the capital is Rangoon, population, 293,316.

**Burne-Jones, Sir Edward C.,** a notable English painter, much admired in his day as a fine colorist, and clever also as an artistic stained-glass designer. Born at Birmingham in 1833 and educated at King Edward's School there, he entered Exeter College, Oxford, in his twentieth year, but shortly afterwards withdrew to study art under the influence of Dante G. Rossetti. Settling in London, he drew much from real life both in water-colors and in oil, his pictures possessing much brilliancy as well as purity of hue. He is classed among the Pre-Raphaelites, but himself free from the whilom extravagances of that school of art. In 1881 Burne-Jones received from Oxford the honorary degree of D.C.L., and in 1885 was elected President of the Royal Birmingham Society of Artists and made an Associate of the Royal Academy of Arts, London. The latter he resigned in 1893 when he became one of the founders of the New Gallery, where and at the Grosvenor Gallery, in the British metropolis, most of his pictures were first exhibited. In 1894 the artist was made a baronet, elected an honorary Fellow of Exeter College, Oxford, and was decorated with the French Legion of Honor. At an early period in his career he came under the influence of Ruskin; while, besides his varied and magnificent work as a painter, he did much as a designer of mosaics for church windows, at Oxford and elsewhere in England, as well as for the apse of the American Church at Rome. Among his best known oil paintings are *King Cophetua and the Beggar Maid, The Resurrection, The Annunciation, The Golden Stair, Merlin and Vivien, Pygmalion and the Image.* His principal water-colors include *The Days of Creation, The Wine of Circe* and the series known as *Spring, Summer, Autumn, Winter, Day* and *Night.* Sir Edward Burne-Jones died in London in 1898.

**Burnett', Frances Hodgson,** an American novelist, was born at Manchester, England, in 1849. In 1865 her family came to America and settled in Tennessee, where she began writing stories. Her first story was published in a magazine in 1867. In 1873 she married Dr L. M. Burnett, of Knoxville, Tenn. They removed later to Washington, D. C. Her first novel, *That Lass o' Lowries,* was published in *Scribner's Magazine* in 1876–77, and made her reputation. Her second novel, *Haworth's,* was published in *Scribner* and also in *Macmillan's Magazine* (London). A child's story, *Little Lord Fauntleroy,* was very popular, and has appeared also as a play acted on the stage. Her later stories are *A Lady of Quality, His Grace of Ormonde* and *The Shuttle.*

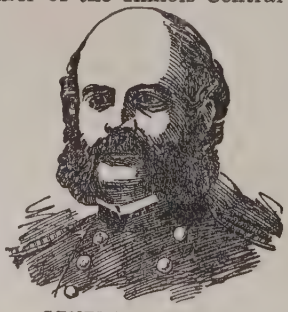
FRANCES H. BURNETT

**Burnham, Sherburne Wesley,** a notable astronomer, now professor of practical astronomy, in the University of Chicago, was born at Thetford, Vt., in 1838. While clerk of the United States circuit court in Chicago, he early devoted himself to the study of the heavens and made many discoveries, especially of double stars, which he described with a 6-inch refractor. In 1876 his devotion to astronomy led to his connection first with Chicago Observatory and for a time with the Lick Observatory in California. For his discovery, measurement and cataloguing of double stars, he was awarded the gold medal and made a Fellow of the Royal Astronomical Society of England.

**Burns, Robert,** a Scottish poet of great genius was born near the town of Ayr in

1759. His father was a poor farmer and Robert was brought up on the farm, gaining most of his education between his hours of work. The Bible and a few collections of poems were the books he read. His beautiful poem, *The Cottar's Saturday Night*, is a picture of his simple home in those early days. When he was 15 years old, he wrote his first poem, led to it by his love for a little girl who worked with him in the hayfield. Through all his life Burns had a great love for women, and many of his most beautiful pieces are love-poems. At 18 he went to school for a short time, and at this period wrote several short poems. A few years later, he and his brother took a farm, in order to support their parents, but he still kept writing bits of poetry, which were far more successful than his farming. Finding that he was not succeeding on the farm, he decided to go to Jamaica, and published a volume of poems to pay his way. This volume at once made him famous, and instead of setting out to Jamaica, he went to Edinburgh, where he remained a year and made many valuable acquaintances. He rented a farm, and was soon after given a small government office, with a salary of $350. Unfortunately, he was of intemperate habits, and had to give up his farm. He, however, kept on writing, but his love of drink and the disappointment of his hopes of success injured his health, and he died in his thirty-seventh year, in 1796. His poems are the most musical in the language. His humor is great; and many of his poems are very simple and touching, while others sparkle with life and wit. He is a poet of nature, and few have approached him in simple, clear and yet touching descriptions of nature's scenes, objects and life. In 1813 a monument was erected to his memory at the town of Dumfries, and his birthday is still celebrated among Scotchmen. More people visit Ayr than Stratford.

**Burn'side, Ambrose Everett,** an American general, born at Liberty, Ind., in 1824. He graduated at West Point in 1847. At the outbreak of the Civil War he held the position of treasurer of the Illinois Central Railroad. In 1861 he was appointed colonel of the First Regiment of Rhode Island volunteers, and commanded a brigade at the battle of Bull Run. After taking part in various engagements, he succeeded General McClellan as commander of the Army of the Potomac.



GENERAL BURNSIDE

General Lee took possession of the heights of Fredericksburg, and in a vain attempt to drive him from his position Burnside was defeated with great loss. His resignation of the command was accepted, and he was given the generalship of the department of the Ohio. He drove the Confederates out of East Tennessee, for which he received the thanks of Congress. He was later besieged in Knoxville, until the siege was raised by the approach of Sherman with a part of Grant's army. He was then transferred to the Army of the Potomac, and took part in its closing campaigns. He resigned in 1865, and the next year was chosen governor of Rhode Island, and re-elected in the two following years. He was elected United States senator from Rhode Island in 1875 and again in 1880. He died at Bristol, R. I., September 13, 1881.

**Burr, Aaron,** third vice-president of the United States, was born at Newark. N. J., in 1756. He graduated at Princeton College, and entered the army, where he won distinction and attracted the favorable notice of Washington. Soon after, however, for some unknown reason he incurred Washington's dislike. After the Revolutionary War, he practiced law at Albany, and married the widow of a British officer. He was appointed attorney-general of New York, and in 1791 was returned to the United States senate. In 1800 he was elected vice-president of the United States by the Democratic party. Four years later he was the Federalist candidate for governor of New York; but many of the leading men of the party refused to support him, and he was defeated. This led to his duel with Alexander Hamilton, in which Hamilton was killed. Burr was tried for murder, and, though acquitted, never regained his place in popular opinion. The next year Burr set out on a journey to the southwest. He was suspected of plotting to found a new empire out of Mexico and a part of the present southern states, and was arrested and tried at Richmond, Va., but was acquitted. He went to Europe in the following year but returned in 1812, and began again the practice of law in New York. He died neglected in 1836, his only child, Theodosia, having been lost at sea. His success was largely due to his attractive and polished manners

AARON BURR

**Burroughs** (*bŭr'rôz*), **John,** American naturalist, essayist and man-of-letters, was born at Roxbury, N. Y., April 3, 1837, and received an academic education. For a time he taught school, was a treasury clerk at Washington, D. C., and afterwards examiner of national banks. Since 1874 he has lived on a farm, devoting himself to literary work and to fruit-culture and the observation of nature, of which he is an ardent lover and keen and kindly observer. His studies of birds and of field-life have been close and intimate; and his books on these and other themes make delightful reading. Among his publications are *Wake-Robin; Signs and Seasons; Pepacton; Riverby; Birds and Poets; Winter Sunshine; Locusts and Wild Honey; Fresh Fields; Indoor Studies;* and a monograph on *Walt Whitman.*

**Burwash, Rev'd Nathaniel,** born at St. Andrews, Quebec in 1839. A graduate of Victoria University, ordained 1864. Later studied at Yale. In 1867 appointed professor of natural history and geology at Victoria University. In 1887 he became president of the University. A member of each general conference of the Methodist Church from 1874 to 1894. In 1889 president of the conference, contributed largely to bringing about the federation of the universities which was effected in 1885. The author of a treatise on *Wesley's Doctrinal Standards.* Has been most influential in every branch of educational reform in the province (Ontario). A leader of Methodism for a whole generation.

CHANCELLOR BURWASH

**Business College.** The business or commercial college is, properly speaking, a trade school for the purpose of teaching those desirous of securing an elementary position in business, such as that of clerk or bookkeeper, the things of immediate use to them for that work. It is a private institution usually, without endowment or government inspection.

Conditions of admission are very lenient, and pupils may enter at any time. As pupils differ widely in age, preliminary training, etc., much of the instruction is given individually rather than in classes. The length of the course varies from three months up to 15 months or more, and tuition fees range from five dollars per month up to about twenty dollars. Evening classes have been largely taken advantage of by those who were obliged to pursue their usual occupation during the day.

Owing to the introduction of commercial courses into the public schools and to competition among themselves, the business college has developed from the type of 50 years ago with one or two teachers giving elementary instruction in arithmetic, keeping of accounts and ornamental penmanship, to the thoroughly equipped business college of to-day, with trained teachers offering first-class courses in a wide range of subjects, such as stenography, typewriting, commercial law and geography, history of commerce, business practice and office methods, advanced bookkeeping, etc. Present tendencies are towards longer courses, with more instruction both in the broader general studies, such as English composition, and in the more specialized technical lines.

The business college has been of immense value in giving to thousands of persons in a short time the necessary equipment for a business position, and in securing suitable situations for them.

**Butcher-Bird.** See SHRIKE.

**But'ler, Benjamin Franklin,** American lawyer, soldier and statesman, was born at Deerfield, N. H., November 5, 1818. He entered on the practice of law in Lowell, Mass., in 1840, where he gained a high reputation. He served in the state legislature, both in the house and in the senate (1853–59). He served as major-general in the Civil War; was in command at Fortress Monroe in 1861; at New Orleans in 1862; and of the department of Virginia and North Carolina in 1863. He was returned to Congress by the Republicans in 1866, where he served until 1879, except the term of 1875–77. In 1882 he was elected governor of Massachusetts by the Democrats. In 1884 he was an unsuccessful candidate for the presidency in the Greenback interest. He died at Washington, D. C., January 11, 1893.

**But'ler, Nicholas Murray,** Ph.D., LL. D. Born in Elizabeth, N. J., April 2, 1862; graduated from Columbia College in 1882; and studied in the Universities of Berlin and Paris. In 1885 Dr. Butler became an instructor in Columbia College, and since that time he has been associated continuously with Columbia College and University. He was president of Teachers' College from 1886 to 1891, and in 1902 became president of Columbia University. Dr. Butler has been connected with the administration of numerous important boards and associations, and has received several honorary degrees from both American and foreign universities He is the editor of *The Educational Review,* the author of *The Meaning of Education,* and has made other valuable contributions to the literature of education.

**But'ler, Pa.,** the chief town of Butler County, western Pennsylvania, 33 miles north of Pittsburg. It has a number of

flour and silk mills, glass and oil well supply factories, whose motive power is derived from natural gas. Butler's largest industry is a steel-car works employing 5,000 men; it also has a large oil-refinery and bedstead factory. Four lines of railroads pass through it. Population, 20,728.

**Butte City, Mont.,** the capital of Silverbow County, is situated in the southwestern portion of the state, in the midst of a rich mineral region. It is the largest city in the state, and has five lines of railway. It derives its name from the Big Butte, a high mountain peak in the vicinity of the city. The city has fine public buildings, including court house, opera house, high school and many churches, hospitals and a complete system of public and parochial schools. It has a public library containing 30,000 volumes; also a public law-library. Is well supplied with water, and the facilities of electric lighting and gas and a very efficient street car system. The ore production of the Butte district, chiefly copper, approaches $60,000,000 per year, and is rapidly increasing. The population of the city proper is now estimated at over 40,000, but Butte, inclusive of its suburbs has about 70,000 people.

**Butter,** the fatty part of milk, obtained from milk or cream by churning. Milk is made up of three parts, the cheesy portion or curd, the whey or watery part which contains milk-sugar, and the butter; and when examined by the microscope is seen to consist of a number of little globules of fat floating in a clear liquid. These globules collect and form cream after the milk has stood a few hours, and the process of butter making or churning is simply to cause the particles of fat to come together in a mass. After churning, the butter is washed and salt added to prevent the forming of certain acids which give old butter its rancid taste. Besides the common method of churning, butter is made in parts of South America, by jolting the cream, which is put in gourds or skin bags, on the backs of donkeys, or, as in Buenos Ayres, by dragging it in a skin-bag behind a galloping horseman. Indeed, butter is said to have been discovered by carrying milk in skin bottles on camels, in which the butter was made by the jolting. It takes about two quarts of cream to make one pound of butter. Artificial butter, called oleomargarine, is now made from beef-fat.

**Buttercup,** a well-known wild-flower, member of the Crowfoot family. It was brought to this country from Europe and is generally distributed throughout Canada and the United States. In the north, Buttercups are especially abundant and handsome. Their season of blooming is from May to September, localities preferred by them meadows, fields, roadsides and grassy places. English children call Buttercups, King-Cups or Gold-Cups. Shakespeare speaks of them as "cuckoo-buds of yellow hue," and says they "do paint the meadows with delight." There are many kinds, but the first comer is the Bulbous Buttercup, blooming early in May, lasting till the end of June; a small, erect plant of meadow and roadside, the blossoms golden-yellow, leaves bright green. The Meadow Buttercup grows in field and by roadside, sometimes rises as high as three feet, and blooms from May to August, occasionally until frost, the flower, pale yellow. The Swamp or Marsh Buttercup, dots with gold low meadow lands, blooming from April to July, its blossoms huge and satiny. Children are warned not to bite Buttercup stem and leaf, as a blister might result. Buttercups, if eaten in large quantities by cows, might prove poisonous, but the acrid taste is too disagreeable for more than a few nibbles.

**Butterfly,** the common name for a group of day-flying insects. Butterflies and moths form a natural order of the class *Insecta*, and are so closely related that they should be considered together. Nearly every boy knows that a sort of dust sticks to the fingers after handling butterflies and moths. This dust, examined under the microscope is seen to be made up of minute scales, with which the wings of these insects are covered, and this circumstance gives them

BUTTERFLY

the name of the scaly-winged (*Lepidoptera*). It is a common mistake to suppose that the moths are all plain and somber in color, while butterflies are more brilliant. The group of moths, on the contrary, embraces some of the largest and most beautiful members of the order. The butterflies are day fliers, their antennæ are knobbed at the end, and they fold their wings vertically over the back when at rest. The moths fly mainly at night; their antennæ are of various forms; and their wings are seldom elevated in repose.

Butterflies and moths make an attractive cabinet. A collection can be started with very little trouble. The requirements are: a net spread over a hoop attached to a cane or pole; a killing fluid, as chloroform

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MEXICAN BUTTERFLIES

or benzine; a board for spreading the wings until they are dried, and a tight covered box in which the specimens may be kept. Hodge in *Nature Study and Life*, recommends a home-made glass case, specimens glued. As is well known, butterflies and moths come from caterpillars and various other larvæ forms. The eggs are laid by the full-grown insects, but from them hatch worm-like larvæ instead of winged insects. After feeding and moulting, the larvæ in turn form cocoons or cases about themselves, from which they emerge as butterflies and moths. The larvæ are exceedingly varied; the common, woolly caterpillars, the measuring worms, forming a group of moths; the tomato worm, the milkweed worm are familiar examples. From the cabbage worm come the white butterflies that are so common. Some are destructive to crops, as the army-worm; some to fur and woolen fabrics, as the small, inconspicuous larvæ of the woolen moth; and some to trees, as the gypsy moth. (See CATERPILLAR.)

Among the butterflies of the United States the swallow-tailed variety (see Fig.) is the largest and most attractive. The common yellow and white varieties are the most numerous. The brownish milkweed butterflies are very well known. The *promethea, polyphemus* and *luna* moths are large and beautiful, as are also the moths of the silkworm. Some of the common, dark-colored butterflies (*euvanessa antiopa*) live through the winter in sheltered places in the middle and northern states and come out on warm days. Some of the large tropical butterflies are exceedingly brilliant in color, and measure upward of eight inches in spread of wings. The mouth parts of butterflies and moths are much changed. There are no biting jaws, but a long, sucking tube, coiled like a watch-spring when not in use, sucking nectar and honey from flowers. Some of the forms resemble leaves when the wings are folded over the back, and are protected from their enemies by this resemblance. See Scudder: *Everyday Butterflies* (1899); French: *Butterflies and Moths of the E. U. S.* (1896); Holland: *The Butterfly Books*, with colored plates but of moderate price; the beautiful and extensive monographs of Edwards and Scudder; Weed: *Life-History of American Insects;* Comstock: *Insect-Life;* and Crojin: *Our Insect Friends and Foes.*

**Butternut** or white walnut, is an American tree, growing to a height of 20 to 50 feet. It has numerous spreading branches and a smooth, ash-colored bark. It blossoms in May, and the fruit ripens in September and October. The fruit is an oblong nut, covered with a thin husk or hull, dark-brown when ripe. The kernel is sweet but oily. The bark and shells yield a dark-brown dye, and a poor quality of sugar can be obtained from the sap. The half-grown fruit is also used for pickles. The timber is valuable, and is much used for cabinet-making, gun-stocks, etc.

**Butterworth, Hezekiah** (1839–1905), a well-known writer of juvenile books, and a poet of fair ability, was a native of Warren, R. I. Mr. Butterworth was a platform lecturer of repute, speaking at times upon education, at times on hymnology, but for the most part upon his travels, which included tours in Europe, South America Cuba and Canada. Among the works of Butterworth, most of them books for boys, may be mentioned several volumes of *Zig-Zag Journeys*, the *Knight of Liberty, In the Boyhood of Lincoln, Great Composers, The Patriot Schoolmaster, Songs of History, Poems and Ballads* and *Boys of Greenway Court*, together with several cantatas.

**Buttons**, useful articles of wear, used as coat and dress fasteners or as mere ornaments, and made of bone, wood, metal, jet, papier maché, mother of pearl or glass. They are manufactured in various sizes, and sometimes covered with cloth or other material, and also made with and without shanks. Birmingham, England, is a great seat of their manufacture; while they are extensively turned out in factories in this country, in the different varieties of the button industry, there being to-day about 250 button-making factories in the United States, with a gross value-output of close upon $8,000,000. The process of manufacturing them is chiefly by stamping in the case of metal buttons; while the cast button is made in molds by pouring molten metal over them, the loop of wire which forms the shank being suspended in the process and pressed into the bottom of the button. Powdered steatite, saturated with soluble glass, is used for making shirt buttons in molds, the buttons being afterwards baked and polished. Other kinds of buttons are made of various composites, as well as of vegetable ivory and of the hoofs of cattle, boiled down and turned out in hydraulic presses of the various sizes and patterns.

**Buzzard.** The term is used in a loose way. The true buzzards include the hen-hawks and the common buzzard of Europe. The hen-hawks, embracing the red-tailed and rough-legged buzzards, are good representatives of the group as to general appearance and average size. The white-tailed buzzard of South America and the common fish-hawk or osprey are other varieties. The true buzzards are related to the eagles and falcons. The so-called turkey-buzzard belongs with the vultures, and not with the buzzards. In the south this bird is protected by law, both whites and negroes appreciating its services in removing decaying matter. Seen floating high up in the air, one forgets its habits and thinks only of the beauty of its motion;

it is very familiar to the children of the south.

**Byron, George Noel Gordon, Lord,** a great English poet, was born at London in 1788. His father died when he was three years old, and he was brought up by his mother, a woman of weak mind. He attended Cambridge University in 1805. Two years after, he published his first volume of poems, which at once brought him into notice. In 1808 a criticism of his poems appeared in the *Edinburgh Review*. He replied to it in a satire called *English Bards and Scotch Reviewers*, which at once showed his power as a writer. During this time he was living at Cambridge and in London, and spending his time immorally and in frivolous high-class society. Becoming tired of this mode of living, and thinking that his genius was not appreciated, he left England and traveled in Spain and Greece. During his travels he wrote the first part of his greatest work, *Childe Harold's Pilgrimage*. While in Greece he performed the famous feat of swimming across the Hellespont, in imitation of the Greek story of Hero and Leander. On his return to England he was received with great favor. His *Giaour*, *Corsair* and *Lara* were written soon after. He married, but was afterward separated from his wife, and, owing to public disfavor, he left England never to return. He stayed in Geneva for a time, where he wrote his *Prisoner of Chillon*. Later on he lived in Venice, where he finished *Childe Harold*, and began *Don Juan*, one of his notable works. In 1822 he sent money to the Greeks, who were fighting for independence from the Turks; and soon after went to Missolonghi to join the Greek forces, but died there of a fever, in 1824. He is now considered one of the greatest of English poets. His power of description has rarely been equaled. See *Life of Byron* by Thomas Moore.

**Byzan'tine** (*bĭ-zan'tĭn*) **Empire,** also called the EAST ROMAN, EASTERN, GREEK or LOWER EMPIRE, was founded in 395 A.D., when Theodosius the Great divided the Roman empire between his two sons, Honorius and Arcadius. Arcadius was made emperor of the eastern division: Syria, Asia Minor and Pontus in Asia; Egypt in Africa; and Thrace, Mœsia (now Bulgaria), Macedonia, Greece and Crete in Europe. The empire thus formed lasted for more than a thousand years, and underwent a great variety of fortune. It took the name Byzantine from Byzantium, the old name of its capital, which, after 330 A. D., was usually called Constantinople or New Rome.

The period of Greek revival (395–716), as it is called, is marked by the victories of Justinian and Heraclius. Justinian (527–565) is celebrated for his code of laws and the victories of his great generals, Belisarius and Narses. Maurice (582–602), by his weak rule brought the country to a condition of lawlessness from which it was rescued by Heraclius, who overthrew him, and reigned from 610 to 641. Great as his genius was, he suffered 12 years of defeat before he could organize a victorious army. In 622 he began those splendid campaigns in which Persia was crushed, and which, Gibbon says, were equal to those of Scipio or Hannibal.

The period of prosperity lasted from 716–1057, and was marked by successful defense against Saracens and Bulgarians. Leo III, Constantine V, Leo IV, Basilius I and Nicephorus Phocas all won victories over the Saracens and Bulgarians. The dynasty founded by Basilius held the throne most of the time from 867 to 1056. John Zimices (969–976) won victories over Saracens, Bulgarians and Russians, while Basilius II (976–1025) conquered the Bulgarian kingdom. At the beginning of the 11th century the Saracen power, which had so long been dangerous to the empire, broke up, but the Seljuk Turks, a yet more formidable enemy, appeared on the eastern frontier.

The period of the decline (1057–1204) was marked by the crusades and the advance of the Turkish power. With Isaac Comnenus (1057–1059) the Comnenian dynasty began. In the reign of Alexius Comnenus (1081–1118) began the crusades, in which the Byzantine emperors had a hard part to play. The crusades, however, helped greatly to check the advance of the Turks, whose power already reached to the Hellespont. The last Comnenian prince, Andronicus, was killed in a rising excited by his own cruelty, in 1185, and left the country in a state of utter confusion.

The period of Latin occupation lasted from 1204 to 1261. In 1204 the French and Venetians, together called Latins, marched on Constantinople and captured it. The European part of the empire was carved into four divisions; the first part, including Constantinople, fell to the lot of Baldwin, the Count of Flanders. In Asia, Theodorus Lascaris set up a government at Nicæa, and Alexius Comnenus ruled at Trebizond. The Latin occupation was hurtful to the empire, which never regained its lost unity. Michael (VIII) Palæologus, one of the rulers of Nicæa, captured Constantinople in 1261 with the aid of the Genoese, and so put an end to the Latin dynasty.

The period of the fall (1261–1453) was marked by the quick oncoming of the Turks. They took Nicæa in 1339, and first made a settlement in Europe by capturing Gallipoli in 1354. Adrianople fell in 1361, and became the Ottoman capital. By 1381 all that was left of the Byzantine empire became tributary to the Turks. The sultan, Bajazet, by defeating the Hungarians in 1396 forced Manuel II to cede to him a street in Constantinople. The whole city

would soon have fallen had not Timur, the Tartar conqueror, defeated Bajazet at Angora in 1402. At last the capital fell before Mohammed II, May 29, 1453, when the Byzantine empire was brought to a close.

On the throne of this great empire, to which modern Europe owes its moral and intellectual development and which maintained a struggle with darkness for 1,000 years, sat 76 emperors and five empresses. Of these, 15 were put to death; seven were blinded or otherwise mutilated; four were deposed or imprisoned in monasteries; and ten were compelled to abdicate. In the 4th century she fought the Goths; in the 5th the Huns and Vandals; in the 6th the Slavs; in the 7th the Persians and Arabs; in the 8th, 9th and 10th the Bulgars, Magyars and Russians; in the 11th the Seljukian Turks; the Ottomans, Normans, Venetians, Crusaders and the Genoese. "No wonder she at last fell exhausted."

Reviewing its entire annals, the history of the fall of the empire may be said to be the record of a noble struggle in the face of overwhelming odds. For many centuries it was the bulwark of Christian culture. See Gibbon's *Decline and Fall of the Roman Empire* and Finlay's and Grote's *Histories of Greece*. See also CONSTANTINOPLE.

# C

**C** (*se*), the third letter of the alphabet, represents two consonants: *s* and *k*. The *s* sound is called soft *c*, the *k* sound hard *c*. *C* before *e*, *i* or *y* is a hissing *s*, as in *cede*. When *e* or *i* is followed by another vowel in the same syllable, *c* is *sh*, as in *oceanic*. In a few words *c* is *z*, as in *sacrifice*. *C* before *a*, *o*, *u* or a consonant represents the *k* sound, as in *call*, *cold*, *culminate*, *climax*. *C* after a syllable not followed by *e* or *i* also equals *k*, as in *arc*. So, too, in *sceptic* and *scirrous*. It is silent in *corpuscle*, *czar*, *indict*, *muscle*, *victuals*. Its sound comes from the Latin. The Romans used C as a numeral (100) as well as a letter.

**Cabal** (*kȧ-băl'*), a word used to denote a small party united for political purposes. Formerly it was used to denote a secret committee or cabinet, and in the 17th century was especially applied to the infamous ministry of Charles II of England, which was made up of five members whose initials made up the word cabal. They were Clifford, Ashley, Buckingham, Arlington and Lauderdale. The word goes back through the French to a Hebrew word meaning "something received."

**Cab'inet,** a committee of ministers, so called from the cabinet or room in which the ruler assembles his council. In the United States the cabinet is made up of the heads of departments; namely: the secretaries of state, of the treasury, of war, of the navy, of the interior, of agriculture; the attorney-general; and the postmaster-general. By the constitution the president has the power to require the opinion in writing of the heads of departments, on any subject relating to their special duties. Washington started the practice of consulting all the heads of departments on important measures, and later presidents have usually called them together in joint meeting for consultation, so that now they are expected to be present as a matter of course. The president presides at these meetings, and he is responsible for all the measures of the government. There is in this country no premier or chief member of the cabinet, though the position of secretary of state is generally regarded as the leading one. The president usually selects for his cabinet those who agree with his views. The word cabinet was first used as a political term in England. The modern British cabinet is made up of a variable number of ministers, usually about eighteen, among whom are always the first lord of the treasury (who is prime-minister), the lord chancellor, the chancellor of the exchequer, the president of the council and the five secretaries of state. The members have seats in Parliament.

**Ca'ble, George Washington,** an American author, was born in New Orleans in 1844, and after a short career in business entered the Confederate army. At the close of the war, he resumed business in New Orleans and while still so engaged began his work as a writer in connection with the *New Orleans Picayune*. His first stories were collected and published under the title of *Old Creole Days*. *The Grandissimes*, *Madame Delphine* and the *History of New Orleans* soon followed, and in 1879 he gave up his business. In 1884 Mr. Cable settled in Northampton, Massachusetts, and devoted himself to writing and lecturing. *Dr. Sevier*, *The Creoles of Louisiana*, *The Silent South*, *The Cavalier*, *By-Low Hill* and *Strange True Stories of Louisiana* are among his later works.

GEORGE W. CABLE

**Cable-Road,** a railroad on which the cars are moved by being attached to an endless wire rope, which is kept in motion by mechanical power. Cable traction has been used in mines for many years, but it was first successfully applied to street car traction by A. S. Halliday at San Francisco in 1873. For heavy street-car traffic and for places where there are very heavy grades the cable system has been sucessfully employed. The cable, an endless wire rope of one to 1½ inches in diameter, is kept in continuous motion in a slotted groove or conduit below the surface and between the rails, and the connection with the car is made by a grip which can be controlled from the car. The power required to keep the cable in motion without load is large—35 to 75 per cent. of the full load—so that the system is at a dis-

advantage where the load is not heavy and continuous. The cable has been superseded by electric systems almost entirely.

**Ca'bles, Electric,** are wires especially prepared for carrying electric currents underground or under water. The underground cable consists essentially of a cylinder of insulating material, such as guttapercha, in which are imbedded one or more copper wires. These coppper wires do not touch each other throughout their length. The guttapercha keeps the moisture out and keeps the electric current in. The cable is generally placed inside a lead sheathing, which preserves its flexibility and at the same time furnishes protection from mechanical injury. It is now the custom to put a large number of conductors —sometimes, for telephone lines, as many as a hundred—in one lead sheath.

**Ca'bles, Ocean,** telegraph lines laid from shore to shore beneath the sea. The first Atlantic cable was successfully laid in 1866 by Cyrus W. Field. Submarine telegraph lines had already for some years been in operation over short distances. Coney Island and Fire Island had been successfully connected. In Europe a cable had been laid from Dover to Calais, and many others over distances less than a hundred miles. In deeper waters, also, cables had been laid, one from Newfoundland to Cape Breton and another from Spezia to Corsica. In 1857 Mr. Field made his first attempt to lay a cable under the Atlantic from Newfoundland to Valentia in Ireland. This attempt failed, as did several others. In 1858 a cable was laid which worked at first but became silent after a few weeks. In 1865 the *Great Eastern* took on board a vast cable weighing 20,000 tons, and laid 1,200 miles of it, when by a sudden lurch of the ship the cable was snapped. The next year's attempt was, however, successful. The cable, 2,000 miles long, was safely stretched across the ocean, and submarine communication was an accomplished fact. Its first message was the news that a treaty had been signed by Prussia and Austria.

By 1903 there were 16 cables carrying messages through the Atlantic Ocean, besides three that are no longer used. But the greatest triumph of cable-laying was the completion of the British Pacific cable, 7,800 nautical miles long, which now connects British Columbia with Australia. In 1903 an American cable was laid to the Philippines from San Francisco by way of Hawaii. Thus, by means of the overland telegraph and the submarine cable, it is now possible to transmit a message in a few hours to almost any country on the globe.

*Submarine Cables* are laid on the bottom of the sea. They require not only good insulation, but great tensile strength, else they will not support their own weights when lowered from the vessel to the bottom of the sea. This tensile strength is acquired by wrapping the guttapercha insulation with a sheathing of steel wire. There now are 16 cables of this type across the Atlantic Ocean, each carrying two copper conductors. Each of these conductors is capable of transmitting about 20 words a minute. See TELEGRAPH.

**Cabot** (*kăb'ŭt*), **John** or **Giovanni,** probably the discoverer of North America. Very little is known of the life of this seaman. The place and time of his birth and death are not known. Either a Venetian or an Englishman naturalized in 1476, he was living in England in 1495. It probably was the voyage of Columbus in search of the East Indies which started Cabot westward on the same quest. He with his three sons obtained a patent in 1496 from Henry VII, giving them power to search for lands in the eastern, western or northern seas and, as vassals of England, to occupy any lands discovered, with a right to their commerce on paying the king a fifth of all profits. Accompanied by his three sons he set sail in 1497, and on June 24th sighted Cape Breton Island and Nova Scotia. He planted on the coast the banners of England and Venice and returned. The next year another patent was granted, but nothing further is known of his life.

**Cab'ot, Sebastian,** son of John Cabot, was probably born between 1474 and 1477, either at Bristol or at Venice. He accompanied his father on his voyage to Nova Scotia, and in 1498 he sailed with two ships in search of a northwestern passage to India. He left a few men on the bleak shores of Newfoundland and sailed southward along the American coast as far as Florida. Later he entered the service of Spain, and in 1526 commanded an expedition which examined the coast of Brazil and the River Plata, and there attempted to plant colonies. In 1547 he again went to England and became inspector of the navy. He was the prime mover of the expedition of merchant adventurers which opened to England an important trade with Russia. He was famous as the maker of maps, and he was probably the first who made sure that America was wholly a new and unknown continent. He died at London in 1557.

**Cabul.** See KABUL.

**Cac'tus.** The general name of a well-known family called the *Cactaceæ*. The numerous species are characteristic of the warm and dry regions of America, their display being greatest in Mexico. There are about 1,000 recognized species, and many of them are under cultivation on account of their curious forms. They have become remarkably adapted to con-

tinuous drouth. Their leaves have been abandoned for the most part, and the variously shaped stems are organized to expose the least amount of surface and to retain water. The largest forms are species of the genus *Cereus*, among which are the giant cacti, whose columnar bodies with clumsy branches rise sometimes to a height of fifty to sixty feet. The spherical forms mostly belong to the genera *Mamillaria* and *Echinocactus;* the flat forms

CACTI

or prickly pear belong to the genus *Opuntia*. The common prickly pear has long been naturalized in the Mediterranean region. Many of the cactus fruits are edible, and certain genera are very useful to the natives of Mexico. Recent cultivation has produced a spineless cactus which promises to be of great value as a food for cattle. The flowers are usually very showy, and the spines are also often brilliantly colored. The eastern variety, prickly pear or Indian fig, is distributed in this country from Massachusetts to Florida; the western cactus ranges from Minnesota to Texas.

**Cade** (*kād*), **Jack,** leader of the rising in England of the men of Kent, in 1450. He took the name of Mortimer and the title of Captain of Kent, and marched on London with over 15,000 followers and encamped at Blackheath. He complained of certain grievances, and asked the king (Henry VI) to change his counselors. He was forced to retreat, but later gained a victory over a part of the king's forces, and, entering London, beheaded Lord Say, one of the king's favorites. But his troops soon scattered, a price was set upon his head, and he was killed in a garden near Heathfield, Sussex, as he was trying to reach the coast.

**Cad'illac, Michigan,** a city, the seat of Wexford County, on Lake Cadillac, and on the Grand Rapids & Indiana and the Ann Arbor railroad, 96 miles north of Grand Rapids. It is in a region of fine hardwood timber and has large local lumber interests as well as considerable general manufacturing. It has a number of churches, schools and attractive public buildings. Population, 10,000.

**Cadiz** (*kăd'ĭz*), a Spanish city in Andalusia, near the Strait of Gibraltar, capital of the province of the same name. It is situated at the extreme end of a narrow tongue of land projecting from the Island of Leon. It is washed by the Atlantic and the Bay of Cadiz, and is one of the best fortified cities of Spain. The shining granite ramparts and the whitewashed houses give it a bright appearance; but there are few public buildings of note. The Alameda is a pleasant public walk by the seaside. After the discovery of America, Cadiz reached its highest prosperity, becoming the depot of all the trade with the New World. When the South American colonies became independent, the city declined greatly, but has since revived, owing to the extension of the railroad system and the establishment of new lines of steamers. About 3,800 ships enter the port yearly. There also are a number of manufactures. Cadiz was built by the Phœnicians, about 1100 B. C., under the name of Gaddir, meaning "fortress." It was afterward held by Carthaginians, Romans, Goths, Moors and Spaniards. Here Drake destroyed a Spanish fleet; Essex burned and pillaged the city; the French blockaded it; and the Spanish revolution of 1868 found its birthplace at Cadiz. Population, 67,174.

**Cad'mus,** in classical mythology a son of Agenor, king of Phœnicia, and brother of the beautiful Europa. When the latter had been carried off by Zeus, who had become enamored of the beautiful maid, Cadmus, his brothers and mother were sent in search of her. Not finding her, Cadmus proceeded to Bœotia, where, tradition relates, he founded Thebes and built the Cadmeia. Here, the myth continues, he sowed dragon's teeth, which sprang up as armed men who slew each other, save a few from whom the Thebans later claimed descent. Subsequently, Cadmus married Harmonia, a flute-player, and both were changed by Jupiter (Zeus) into a serpent; though another account relates that he went to Illyria. The introduction of the Phœnician alphabet into Greece is attributed to Cadmus, while he is also said to have been the inventor of many useful arts.

**Cædmon** (*kăd'mŭn*), the earliest English writer of note who used his own Anglo-Saxon language, and the first religious poet of the Teutonic race. The account of him is given by Bede. He was a cowherd who had never until quite old learned any poem, and often, at festivals, when it came his turn to take the harp and sing, he would rise from the feast and go home. Once when he had gone from the feast to the stable, there appeared to him in sleep one who said to him: "Cædmon, sing me some song." "I cannot sing," was the

answer; "for this cause left I the feast." "But you shall sing to me." "What," asked Cædmon, "shall I sing?" "Sing the beginning of created things." In the morning he told his dream to Hilda, the abbess of Whitby, and he put into verse for her a part of the Scriptures. Men believed him to be inspired. "Others after him strove to compose religious poems, but none could vie with him, for he learned the art of poetry, not from men, but from God." He was educated and became a monk, spending the remainder of his life writing poems on the Bible histories and on other religious subjects. He died about 680 A. D. Some of his poetry still exists.

**Cæsar** (*sē'zer*), **Augustus.** See AUGUSTUS.

**Cæsar, Gaius Julius,** was born July 12, 100 B. C., of a noble Roman family. He studied at Rhodes to improve his eloquence, and, returning to Rome, threw himself earnestly into public life. Joining Pompey, who was then acting with the popular party, he passed rapidly through the different grades of office. He was quæstor in Spain; as curule ædile he increased his popularity by lavishing vast sums of money on public buildings and games; as prætor he was accused of being concerned in the famous conspiracy of Catiline, but probably unjustly. While consul, with rare tact and wisdom he reconciled the two most powerful men in Rome, Pompey and Crassus, and formed an alliance with them, known in history as the first triumvirate. At the close of his consulship he obtained the province of Cisalpine Gaul and the senate added that of Transalpine Gaul for five years, which were later increased to ten years. In this field Cæsar conducted during the next nine years some of the most wonderful campaigns in history, which alone would have given him an abiding name. In seven successive campaigns he subdued the Helvetii, killing over 150,000 of them, a number of German tribes, the Belgic tribes, the Veneti and other tribes; twice invaded Britain; built a bridge across the Rhine; and closed his brilliant course by crushing a wide-spread rebellion of the whole of Gaul. Twice during this time a thanksgiving was decreed to him by the senate, one for 15 days and the other for 20, an honor never before granted to any general. He now was the most popular man in Rome, and had an army enthusiastically devoted to their victorious leader. But Crassus was now dead, and Pompey, jealous of the power of Cæsar, had veered around to the party of the senate. Cæsar was ordered to disband his army, but, knowing that this meant his political ruin, he refused, and, crossing the Rubicon (a small stream which separated his province from Italy proper), moved swiftly amid the acclamations of the people toward Rome. Pompey and the senate fled to Greece, and in three months Cæsar was master of Italy. Pompey's legates in Spain were soon conquered, and by the famous battle of Pharsalia, 48 B. C., Pompey's powerful army was utterly routed. Pompey himself fled to Egypt where he was murdered. Cæsar next settled the affairs of Egypt, and defeated the generals of Pompey in Africa. His power was now absolute, but he did not use it for bad purposes, as previous conquerors had done, but, declaring that he had no enemies, gave himself to curing the social evils which had been so long rife in the republic. He was called the "Father of His Country" and "Imperator," from which comes the modern title of Emperor, and was made dictator for life. His person was declared sacred and even divine; his statues were placed in the temples; his portrait was struck on the coins; the month Quintilius was named Julius in his honor. He began many reforms, but was cut off in the midst of his work by assassins, and Rome was again plunged into civil war. Brutus and Cassius, both of whom had received favors from Cæsar, and a band of conspirators fell upon the great dictator in the senate house. At first he defended himself, but when he saw Brutus with a dagger in his hand, he cried *Et tu, Brute?* (Thou, too, Brutus?), wrapped his cloak about him, and fell pierced with 23 wounds at the foot of the statue of Pompey. He died at Rome, aged 56, in 44 B. C. Cæsar was one of the greatest men that ever lived. In everything he excelled. He not only was the first general and statesman of his age, but he was its greatest orator, except Cicero. He also was a great historian and scholar.

**Cæsarea** (*sĕz-ȧ-rē'ȧ*), now called by the natives Kaisarieh, was once a proud and splendid seaport. It stood on the coast of Syria, 13 miles north of Joppa. Built by Herod about 22 B. C., it was named in honor of Augustus Cæsar. It was a Greek town, with its temples, amphitheatre and baths, imported into Syria. A mole in a half circle, built of large blocks of stone, protected the port on the north and west, within which a fleet might ride in safety. It was held by the crusaders, who built a cathedral here. Afterward the city fell into decay, and is now a heap of half-buried ruins, with a few miserable stone houses inhabited by fishermen. There is a small, open harbor.

**Cæsarea Philippi,** a city mentioned in the New Testament, stood about 95 miles north of Jerusalem, near the source of the Jordan. The name Philippi was given in honor of Philip the Tetrarch, who repaired the city. It is now a heap of ruins. On its site is a small village called Paneas or Banias.

**Cain,** the first-born of Adam and Eve. A cultivator of the soil, he killed his brother Abel, because his brother's sacrifices were more acceptable to God than his own. For his crime he was condemned to be a fugitive and a vagabond on the earth. He went to the land of Nod, on the east of Eden, where he built a city, which he called Enoch from the name of his son.

**Caine, Thomas Henry Hall,** an eminent English novelist and dramatist, was born of Manx parentage in Cheshire, England, in 1853. His early years were spent as an architect, from which he drifted into journalism, thence into the writing of essays, poems and lastly novels. In fiction his first successes were in the writing of the Manx stories of *The Deemster*, *The Bondman* and *The Manxman*. Contemporary with these were *The Shadow of a Crime*, *A Son of Hagar* and *The Scapegoat*. All of his stories show power, with much constructive skill, and the qualities that attract and hold the reader's interest. His late novels are *The Christian*, which, with others of his stories has been dramatized, and *The Eternal City*. He has also published *Sonnets of Three Centuries* and a volume of *Recollections of Rossetti*. He has for some time been actively interested in the government of the Isle of Man, and is a member of the House of Keys.

HALL CAINE

**Cairo** (*kī'rō*), a famous city and capital of modern Egypt, lies on the right bank of the Nile, near the commencement of the Delta. The modern city is built on the remains of four distinct cities, and is surrounded by stone walls with antique battlements. It is divided into quarters, occupied by the Moslems, the Jews, the Christians, etc., and these quarters are separated by gates closed at night. The most remarkable buildings are the mosques and minarets, which include some of the finest remains of Arabian architecture. The great pyramid is about ten miles from the city. Cairo is also the site of a university, founded in 971, to which 2,000 students flock annually from all parts of the Mohammedan world. The streets are narrow and are traversed by an endless stream of horses, asses, camels and human beings. A few broad streets run through the newer parts of the city. With an area of about seven square miles and a population of about 654,476, Cairo is the largest city in Africa, and second only to Constantinople in the Turkish empire.

It was founded by the Arabs about 976 A. D., and was ruled by the Fatimite caliphs until 1171, when Saladin became master of Egypt. It was the capital of the sultans of Egypt until it was captured by the Turks in 1516. Since 1882 Cairo has been the center of British influence in Egypt. It is under the control of a special governor. Of the races which compose the population, the Arabs are the most numerous. There are about 35,000 Europeans. Railroads and telegraphs connect the city with Alexandria, Suez, etc., and steamers ply on the Nile. There is a busy trade, but few manufactures. There are good schools and a public library. The name Cairo is corrupted from *El Kahira*, meaning "the victorious." See Ball's *Cairo of To-Day*.

**Cairo** (*kā'rō*), a city, the capital of Alexander County, in southwest Illinois, situated at the confluence of the Ohio and Mississippi Rivers, about midway between Memphis and St. Louis. Its wharves are thronged with steamboats and shipping, as it is the shipping-point for southern markets of the products of Illinois, Iowa and Indiana. An extensive system of levees now protects it from inundation. It is well served with railroads and maintains excellent public schools, and has a population of 20,000.

**Caisson** (*kās'sŏn*), a water-tight box used in laying foundations on bases under water or undersurface soils which are saturated in water. There are two kinds, the crib or open caisson and the pneumatic caisson. The open caisson is a box structure of wood or of iron, which is loaded so as to sink into the bed of the stream; the earth is then removed to the required depth and the inside of the caisson is filled with masonry or concrete, the whole forming a portion of the pier. In making the foundations for the Poughkeepsie bridge, the caissons used had a cross-section of 60x100 feet and a depth of over 100 feet. Pneumatic caissons are all on the principle of the diving bell. A large cylinder of boiler iron with closed top is sunk into the water, open end down. The water is kept out by keeping the caisson chamber filled with compressed air. Communication for the passage of workmen and materials is through an air lock. This is an ante-room, having air-tight doors both to the atmosphere and to the compressed air chamber. The caisson is sunk by digging out the soil underneath the caisson. In modern pneumatic caissons the air chamber is a steel arched chamber at the bottom of the caisson tube, and the masonry or concrete is built in on top of this chamber as the caisson sinks. The air pressures used are

often so great as to endanger life. Frequent shifts of workmen are required. In the Brooklyn bridge caissons pressures of ten atmospheres were used. Formerly caissons were used only for foundations in water, but within recent years the foundations for many of the tall buildings in New York city have been laid by means of pneumatic caissons.

**Calais** (*kă'lā'*), a seaport of France, is situated on the Strait of Dover. A ring of forts and regions of marshy ground on the south and east which can be easily flooded make the city a secure fortress. Calais has a good harbor and is connected with Dover by steamer and by a submarine telegraph. Calais has been important in history. In 1347 it was captured after a siege of eleven months by Edward III of England. Calais was held until the time of Queen Mary (1558), when it was taken back by the French. It had been called the brightest jewel in the English crown, and the boast had been written over one of its own gates,

"Then shall Frenchmen Calais win,
When iron and lead like cork shall swim."

Population, 72,322.

**Calcium** (*kăl'sĭ-ŭm*) is a white, or as usually prepared in the laboratory, yellow metal. The metal is of no practical importance, but its compounds are very common. Limestone, marble and chalk as well as coral, shells, etc. are compounds of calcium carbonate; quick lime is the oxide; gypsum and plaster of paris consist of the sulphate; and calcium carbide is a manufactured compound used for making acetylene. The earthy part of bones is largely made up of calcium phosphate. It is chiefly calcium compounds that make water hard.

**Calculating Machine,** a machine for adding and subtracting by mechanical

CALCULATING MACHINE

means. There are various forms of such machines, some of them being very complicated. One constructed by Mr. Babbage for the English government to be used in preparing logarithmical and trigonometrical tables is said to have cost $100,000. Practically all these machines are constructed upon one principle. There are a number of dial faces on wheels alongside each other, each with the first ten figures on them. These wheels correspond to units, tens, hundreds, etc., and are so interlocked that ten steps on the units dial move the tens dial one step and so on. By some mechanism any number that can be set up on the dials can be added to itself any number of times, and recorded on the same or another set of dials. Multiplication is taken as a successive addition and division as a successive subtraction. The best known of these machines are the Grant and the Thomas. They can be made to multiply or divide any number of figures by any other number, but with increased number of figures the machinery becomes more complicated. In a common form of Grant machine any number up to five figures can be multipled by any other number up to five figures. Thirteen figures are the limit of a common form of the Thomas machine. Forms of calculating machines are now used in banking work as well as in engineering and statistical work.

**Calculus** (*kăl'kŭ-lŭs*) means any method of making mathematical investigations by means of algebraic symbols. There are several sorts of calculus, but the term commonly means the infinitesimal calculus, that is, the principles of mathematical reasoning by the use of symbols that represent and express the infinitesimal increases (variations) of quantities. Arithmetic and algebra consider numbers to be finite and discontinuous, but calculus deals with them as capable of growth continuous and infinite. Hence calculus investigates quantities whose values constantly change. Such quantities, for example, are the motions of bodies, as of planets in their orbits, or the amounts of force in the performance of work, neither of which are identically the same at any two instants. Before calculus was invented modern science made but slight progress, but since Newton in 1665 and Leibniz, in 1675, both independently discovered it, science has progressed rapidly. (Leibniz published his discovery in 1684, Newton his in 1687, but Newton was the prior discoverer.) Differential calculus investigates the infinitesimal changes of quantities when the relations between the quantities are given. Integral calculus deduces relations between quantities from those between their infinitesimal variations. The influence of the calculus on nearly all branches of mathematics has been extensive, rendering possible most important advances in astronomy, mechanics and physics.

**Calcut'ta,** the capital of the province of Bengal and the metropolis of British

India, lies on the left bank of the Húgli River, an arm of the Ganges, about 80 miles by the river from the Bay of Bengal. The East India Company founded Calcutta in 1686, and it had gained some importance as a town when, in 1736, Surajah Dowlah, the Nawab of Bengal, captured the city, and the horrible tragedy known as the Black Hole followed. One hundred and forty-six English prisoners were thrown into a cell, 18 feet square, on a hot night in June. There were only two small windows, and these were obstructed by a veranda. The crush of the unhappy sufferers was horrible; and after a night of terrible agony from pressure, heat, thirst and want of air there were in the morning only 23 survivors, the ghastliest forms ever seen on earth. Seven months later the English recaptured the city. It was the seat of the central government of India from 1772 to 1911, when it was transferred to Delhi. The population of the city in 1911, with fort and suburbs, was 1,216,514. Besides these, thousands of the inhabitants of the surrounding districts flock during the day into Calcutta on foot, by boat or by railway to their daily toil. The city extends for about five miles along the river, with an area of nearly ten square miles; while other villages across the Húgli contain many of the government buildings. The city presents a striking appearance as it is approached by the river. On the left are the botanical gardens and the Bishop's College, and in the rear the suburb of Howra. On the right are the government dockyards and the arsenal, and beyond is the Maidan esplanade, which has been called the Hyde Park of India. Here, near the river, lies Fort William, the largest fortress in India, occupying with its outworks an area of two square miles. Among other fine buildings there is the government house, a magnificent palace. Beyond this, along the river bank, is the Strand, two miles in length, adorned by buildings and lined with a splendid series of jetties for ocean steamers. Calcutta has many modern conveniences. There are four theaters, several large European hotels, half a dozen daily newspapers, street railroads, etc. Although the native quarter is far behind the European quarter, it is fast improving. There are several lines of railroad to various parts of India, and the city is the headquarters of the Indian telegraph department. Steamers and sailing vessels supply connection with foreign countries. Besides the University of Calcutta, there are a large number of colleges, schools and learned societies. Calcutta is the commercial center of Asia. Both its sea trade and its inland trade are enormous. Opium, raw cotton, jute, grain, hides, etc. are the principal articles of export.

**Calderon** (*kăl'dĕr-on*) **de la Barca, Pedro,** a celebrated Spanish dramatist and one of the greatest dramatists of all nations, was born at Madrid in 1600, and was educated at the University of Salamanca. At fourteen he had written his third drama. He entered the army and served several campaigns in Italy and in Flanders, gaining a knowledge of men and things which he afterward made use of in his plays. He became a priest and royal chaplain, and died in 1681, still working at his literary labors. He wrote about 500 dramas. Among his greatest works are *The Constant Prince*, *Love is No Joke*, *Life is a Dream* and *The Physician of His Own Honor*. In later life he wrote many religious plays. His imagination was brilliant and his writings abound in beautiful passages. He is called the Spanish nightingale.

**Caledonia.** See SCOTLAND.

**Calendar, Correction of.** The calendar is based on three natural movements: the rotation of the earth on its axis, giving the day; the revolution of the moon around the earth in about 29½ days, giving the month and the movement of the earth around the sun, which, in connection with the inclination of the earth's axis to the plane of revolution, gives the succession of the seasons in a period of about 365¼ days. The month was the earliest standard, and the year was said to consist of 12 lunar months or 354 days. Of course this arrangement did not keep pace with the actual changes of the seasons. Consequently the Jews and the ancient Greeks, who adopted this form of calendar, used to put in a month every now and then—the Jews seven times in every 19 years, the Greeks three times in every eight years. The old Roman method, however, is of more interest to us, because it is from them we get the names of our months. At first they had ten months, beginning with March and ending with December, which means the tenth month. Finding this did not work well, they put in two more months, January and February. This made their year 355 days long, or 10¼ days short. Of course this also did not keep pace with the seasons, so they let the priests put in a month whenever they thought it advisable; and the priests played all sorts of tricks with the year to suit themselves. Then the great Julius Cæsar called in a clebrated astronomer, Sosigenes of Alexandria, and between them they made what is called the Julian calendar. To do this they lengthened the year 46 B. C. to 445 days, and arranged that thereafter the year should be 365 days long, except every fourth year (which we call leap year), which is to have 366 days. The priests did not follow Caesar's directions, and so Augustus, his successor, had to straighten things out again in 8

B. C. These two calendar reformers gave their names to the months of July and August. The names and lengths of the months have been the same ever since. There was still a small error, however, for the real year, the circle of the seasons, is 11 minutes and a few seconds less than 365¼ days. Consequently, by making every fourth year 366 days long the calendar in every four years runs more than 44 minutes ahead of the seasons. By 1500 this error amounted to about 10 days. Then Pope Gregory XIII, on March 1, 1582, decreed that 10 days should be taken out of that year, so that October 5 should count as October 15. Moreover, in order that the mistake might not occur again, he decreed that years ending with two ciphers should not count as leap years, unless the first two digits formed of themselves a number divisible by four. Thus 1900 is not a leap year, but 2000 is. This means that in every four hundred years three leap years will be dropped, that is, three days omitted. We are now dating everything according to this Gregorian calendar. But it was not until 1751 that England adopted the Gregorian reform; and by that time the error in the Julian calendar had increased to 12 days. Parliament then decreed that the day after September 2, 1752, should count as September 14, omitting 11 days, greatly to the consternation of ignorant people. At the same time it was decreed that the year, which had before commenced with March 25 should henceforth begin with January 1. There have been no reforms since then in our calendar. Around 1752 it is not unusual to find two dates given, one according to the old or Julian style, and the other according to the new or Gregorian. The only countries that still adhere to the old style are those that belong to the Greek Church, such as Russia, Greece, Servia, Bulgaria, etc. At the time of the French Revolution the French invented a new calendar, but Napoleon I restored the Gregorian calendar to France.

**Calgary** (*kăl'gȧ-rĭ*), situated at the confluence of Bow and Elbow Rivers, is the largest and most important city in the Canadian middle west. It is only 70 miles east of the Rocky Mountains. Its situation seems to guarantee for it a continuance of its phenomenal growth. Years ago the Canadian Pacific Railway authorities regarded it as a fixed commercial center.

As a ranching center Alberta is unsurpassed in the whole world. For a considerable time southern Alberta was little else than an immense ranch. The west continued to grow, the railways extended farther and farther in all directions. Wheat-growing was tried with astonishing success and all was changed. A grain of wheat planted in the autumn and ripening in the summer brought about the change. Winter wheat has made Alberta famous. This fact is one of the guarantees of the growth and prosperity of Calgary, the population of which is now about 44,000. Another is the irrigation system which the Canadian Pacific Railway constructed on a scale larger than anything heretofore attempted on this continent. In this case irrigation is another word for intensive agriculture and a growing population. Forty thousands of acres of grazing lands are proving through irrigation to be valuable winter-wheat lands.

The Canadian Pacific gives good service to Calgary. The Canadian Northern is fast approaching it from two directions. A road to Hudson Bay is more than a mere possibility. The Grand Trunk Pacific will reach Calgary before the end of 1909. The Great Northern (Mr. Hill's road) is to come to Calgary, and will bring the southwest part of Alberta in touch with it. This road will bring cheaper coal. In a word, more railroads are projected into Calgary than to any point west of Winnipeg.

Extensive coal-beds surround Calgary on all sides. The Canadian Northern Railway is using this coal, and it contributes to make Calgary a successful manufacturing center. West of Winnipeg, Calgary is the leading place for wholesale houses. Its custom receipts grew from $176,134,000 in 1904 to $604,358,000 in 1907. The freight receipts of the city (C. P. Ry.) in 1903 amounted to 94,000 tons and in 1907 to 291,000 tons. Its educational facilities are a credit to its spirit of foresight and enterprise. Its normal school (a handsome well-equipped structure) furnishes adequate professional training for the district surrounding it. It also has prosperous churches and a good hospital. It bids fair to be a considerable city in the near future. Calgary is the headquarters of the British Columbia Land and Irrigation Departments of the Canadian Pacific Railway.

**Calhoun** (*kăl-hōōn'*), **John Caldwell** an American statesman, was born in Abbeville County, South Carolina, in 1782. He graduated at Yale College with high honors, studied law and after serving in the state legislature was sent to Congress. He took an active part in urging the war with England in 1812 and many other measures. After six years in the house of representatives, he became secretary of war in the cabinet of President Monroe, and in 1824 was elected vice-president of the United States, and four years later was again elected to the same office. He became about this time an advocate of free-trade, and believed in the doctrine of state sovereignty or state rights. He was the author of the *South Carolina Exposition*.

which declared that any state can make null and void unconstitutional laws of congress. Calhoun resigned before the close of his term, and was elected to the United States senate. He was secretary of state for a short time under President Tyler, and negotiated the so-called Tyler treaty for the annexation of Texas. He returned to the senate, where he remained until his death at Washington, March 31, 1850. Calhoun was one of the foremost of American debaters. He, Webster and Clay were called The Great Trio. His debate with Webster in 1833 on the nature of federal government was one of the most noted for eloquence and ability in the annals of any country.

**Cal'ico,** a white cotton cloth, received its name from Calicut, a seaport on the west coast of India, whence it was first imported to Europe. The word calico has come to be used to include colored cotton cloths, which are not sufficiently fine to be classed with muslins. Calico-printing or the art of printing colored patterns upon cloth is a process not limited to cotton cloths. It is applied also to woolen, worsted, silk and linen fabrics. This process was known in Egypt in the first century; and in India perhaps at an earlier date. Although calico-printing was not practiced in Europe until the 17th century, the chief center of the industry now is Lancaster, England. The older form of calico-printing was by means of wooden blocks pressed upon the cloth by hand. At present engraved cylinders of copper are used, upon which the cloth is made by machinery to revolve rapidly. It is possible to print in several colors from the same cylinder and at the same time. The manufacture of cotton-goods is a rising industry in the south of the United States, where 1,000,000 bales of cotton are now annually woven into cloth.

**California.** Excepting Texas, California is the largest state in the Union. It extends from the Oregon line on the north to the Mexican boundary on the south, a length of nearly a thousand miles; and from the waters of the Pacific Ocean on the west to the crest line of the Sierra Nevada Mountains on the east, a width of over two hundred miles. It is two and one half times as large as all New England, containing 158,360 square miles.

The population of the entire state is now 2,983,843. The largest city is San Francisco, with a population of 416,912. Los Angeles is a close second, having now passed the 400,000 mark. Other chief cities in the order of size are Oakland, San Jose, Sacramento (the state capital), San Diego, Stockton and Fresno.

*Surface and Climate.* The Coast Range Mountains are a series of parallel ridges running north and south the entire length of the state and distant from the sea forty miles or less. The peaks rise to five thousand feet in altitude. The parallel ranges of the Coast Range and the Sierra Nevada extending lengthwise through the state divide it into long, narrow regions quite different in physical character. The coast regions extend from the sea-board to the Coast Range; the interior is the trough-like depression between the Coast Range and the Sierra Nevada foothills, sometimes called the great valley of California; and the Sierran region embraces the mountain areas along the eastern border.

It is a state of striking contrasts. It contains the highest land in the United States (excluding Alaska) in the summit of Mt. Whitney, 14,500 feet above sea-level; and also the lowest land, in the bottom of Death Valley, some 300 feet below the level of the sea. In the southeastern corner are the vast areas of the Colorado Desert, the hottest and driest region of our country, where there is practically no rainfall, and the thermometer rises to 130° in the shade; and in the opposite or northwestern corner are the dark and dripping forests of Del Norte County, where the rainfall is eighty inches per year. There are alpine climates in the Sierran counties; marine climates in the coast counties; humid climates in the northern counties; arid climates in the eastern counties; semi-tropic climates in the southern counties. There are many thermal belts and local areas of special climatic conditions, as for instance, Boulder Creek in Santa Cruz County, where the rainfall is eighty or ninety inches, although surrounded by lands where it is only twenty inches or less; and Imperial County, below the level of the sea, where melons and apricots ripen in the open air in May, peaches and grapes in June; and the orchards of Butte County in the northern part of the state, where great orange groves produce abundantly in the latitude of Ohio and New York.

*Products and Industries.* This variety in surface and climate makes a corresponding variety in the soils, the crops and the activities and occupations of man. Thus, the north coast is devoted to lumbering. Three hundred million feet of lumber per year are made from the splendid redwood trees (*Sequoia Sempervirens*) and shipped to the markets of the world, particularly to the ports of the Pacific Ocean.

The middle coast is devoted to dairying. The cool, even temperature and abundant moisture produce fine pasturage nearly all the year. Swiss, Italian and Portuguese settlers are found in large numbers, and butter and cheese are the staple products.

The southern coast is a vast summer resort. The soft, luxurious climate, the seabathing, the picturesque scenery, the fruits and flowers form attractions that draw countless thousands of people from all parts of the United States and from foreign coun-

tries as well. Santa Barbara, San Buenaventura, Venice, Newport, Long Beach, Naples, Ocean Park, Huntington Beach, San Diego, Oceanside, Coronado and Santa Monica are some of the best known towns.

The interior of California on the north consists of the Sacramento Valley, an empire of agricultural land. It is abundantly watered by the streams flowing down from the neighboring mountains into the Sacramento River. The soil is deep and rich and is adapted to all the agricultural and horticultural products of the temperate zone. Sacramento ships each year 6,000 carloads of fruit to the eastern states, principally peaches, strawberries, pears and grapes. Wheat, barley, potatoes and asparagus are produced in great quantities for the world's markets.

The central interior consists of the San Joaquin Valley, which is cut off from the southern part of the state by the Tehachapi Mountains, a transverse range connecting the Sierras and Coast Range. This valley rivals the Sacramento in its great extent and its fertility, but, lying further south, it is not so abundantly watered. Wheat and raisins are its staple crops. Fresno ships 5,000 carloads of raisins per year. The oil fields of Kern County are assuming great importance. There is a Standard-Oil pipe-line leading two hundred miles northerly to San Francisco.

The southern interior is largely devoted to growing citrus fruits, Riverside, Redlands, Ontario, Pomona, Azusa and Highlands are some of the centers for the orange and lemon groves. Riverside alone ships 6,000 carloads of oranges per year. This region depends upon irrigation for its prosperity. It virtually is a reclaimed desert. All the fruits and flowers of the temperate and semitropic regions thrive. In one orchard may be grown oranges, lemons, citrons, pomelos, apples, peaches, pears, apricots, nectarines, plums, prunes, pomegranates, guavas, quinces, figs, olives, grapes of more than a hundred kinds, blackberries, raspberries, strawberries, loganberries, walnuts, chestnuts and almonds. The wealth of ornamental trees and flowering plants is too great to catalogue. A number of ostrich farms raise plumes for the market. Hundreds of apiaries produce honey in hundreds of tons.

The chief products, with the approximate annual output, are as follows: fruit products, 90 thousand carloads; lumber, 600 million feet; wool, 25 million pounds; wheat, 17 million bushels; petroleum, 33 million barrels. Of vinuous liquors the State of California alone produces 68.1% of the total for the United States, and California champagne took the Grand Prize in Paris in 1912.

The Sierran region yields the gold that makes California the golden state. It includes great lumbering interests in pine, cedar and giant-redwood forests. It affords pasturage for innumerable flocks and herds. Its streams and waterfalls are the source of power sufficient to gridiron the entire state with electric railways and to turn the wheels and light the lamps of a thousand industries. The central part of this great mountain mass is known as the High Sierras, and affords the playground for the continent. Nineteen peaks are above 10,000 feet in height. There are many hundreds of lovely lakes, of which Tahoe is the largest. There are scores of magnificent waterfalls, such as those of the Yosemite Valley. There are stupendous chasms bordered by minarets and towers, as King's River, Hetch-Hetchy and Kern River Canyons.

There are rich mountain meadows and clear, cold trout-streams and snow-covered mountain tops above the timber line. The botanist, the fisherman, the hunter, the lover of out door nature may wander for months in this wide wonderland among the clouds, traveling all the time and never seeing the same thing twice. The exquisite golden trout of Volcano Creek is here. The big-tree groves of *Sequoia Gigantea* are here, with single trees 325 feet high, 120 feet in circumference. There are canyons with perpendicular walls 4,000 feet deep.

The whole region should be set apart as the great pleasure-ground of America, to be held and cared for by the nation through all generations.

*Minerals.* There is a very wide range in mineral products. Gold has already been spoken of. Silver and lead are produced in the south. Shasta County has great copper smelters. Mercury is produced by Santa Clara and Lake Counties. The gem-mines of San Diego County are becoming famous for their tourmalines, beryls, kunzites and garnets. Opals, jade, turquoise, diamonds and chrysoprase are found in merchantable quantities within the state. There are great slate-quarries and asbestos mines in El Dorado County. Iron is being smelted in an electric furnace in Shasta County. Lithia rock is mined in San Diego County, and lignite coal in Contra Costa County. The borax, soda and salt deposits of the southern deserts are important exports. Manganese, molybdenum, onyx, gypsum, serpentine, talc, graphite, marble, magnesite, fluor spar, heavy spar, lime, cement, potters' clay, glass sand, infusorial earth, mica, asphaltum, tin and antimony also are found in different parts of the state. The total value of mineral products was over 86 million dollars in 1910. The petroleum output was largest, amounting to over 35 millions. Gold stands next in importance, and Portland cement third.

*Transportation.* In commerce, California is the gate to the Orient. The spacious and noble harbor of San Francisco floats the ships of the world. Second in excellence is the harbor of San Diego in the south. Humboldt Bay, San Pedro Bay and Tomales Bay afford good harbors. The Sacramento and San Joaquin Rivers are navigable into the

heart of the agricultural interior, making cheap freight rates for farm-products. Five transcontinental railroads come into the state from the east. There are 6,000 miles of steam railroads within the state. Suburban electric lines for passengers and freight reach for trade in every direction, stimulated by the abundant power of the mountain waterfalls.

The completion of the Panama Canal has added greatly to California's commercial advantage, extending her markets and lowering the freight rates to the eastern states and all Atlantic ports.

*Manufactures.* The manufacturing establishments are mostly found in San Francisco and around the shores of San Francisco Bay. They include sugar refineries, oil refineries, flour mills, powder mills, reduction works, tanneries, machine shops, chemical works. There are extensive canneries for fruit and vegetables in all parts of the state. There are nine large beet-sugar factories, producing more than 40 thousand tons of sugar per year. The value of manufactured products is over five hundred million dollars per year.

*Education.* The educational system stands very high. It undertakes to provide as good a teacher and as well equipped a school for the small remote rural communities as for the larger centers of population. Every district must maintain a free school for at least six months every year. Sixty dollars per month are a minimum salary for the rural teacher. Thirty dollars per year per pupil are raised for the schools by public taxation on the state and the county. The rural school houses and grounds throughout the state are remarkably handsome and well improved. Few of them cost less than $2,000 each. The county is the unit in school administration, presided over by a county superintendent of schools and a county board of education. Over the whole state there are a superintendent of public instruction and a state board of education. By way of higher education there are eight state normal schools, over two hundred high schools, one polytechnic school, a state university with 3,000 students, the famous Leland Stanford Jr. University, with an endowment of thirty million dollars, and a large number of sectarian and private institutions. There are two state reform-schools and about forty orphan schools.

*History.* The coast was visited by Sir Francis Drake in 1579. The first settlement was made at San Diego in 1769 by Spanish priests coming from Mexico. A chain of twenty-one missions for christianizing the Indians was built along the coast by the Franciscan fathers during the next fifty years, among them San Luis Rey, San Juan Capistrano, San Gabriel, San Buenaventura, Santa Barbara, Santa Ynez, San Luis Obispo and Monterey, reaching from San Diego in the south to Sonoma in the north. These missions became rich in flocks and herds and choicest lands. The social life and the political history of California revolved around them. The Mexican government secularized the missions in 1834, and during the next few years the Mexican governors of California granted their rich lands to Spanish and Mexican families. These grants form the basis of the land-system to the present day. California came into the possession of the United States in 1848, at the close of the Mexican War, by the treaty of Guadalupe Hidalgo. Gold was discovered at Coloma in the Sacramento Valley the same year. This at once brought a rush of population that was the wonder of the world. In 1850 the state was admitted full fledged to the Union. Since that time its history has been merged in that of the United States.

**Califor'nia, Gulf of,** a gulf of the Pacific Ocean between the peninsula of Lower California and Mexico. It is about 700 miles long and from 40 to 100 miles wide. The Colorado River and several other streams empty into it from the east. Many small bays indent its coasts, while several islands stud its surface. On its shores are the ports of Loreto, La Paz and Guaymas. The northern harbor is full of shoals, hidden rocks and dangerous currents, but the southern part is safer. The west coast abounds in pearl oysters, but the fishing is now little pursued, though formerly it was important.

**Califor'nia, Lower** or **Old,** is a peninsula and territory of Mexico, and is separated from the remainder of Mexico by the Gulf of California. Its area is 58,328 square miles, a little more than a third of the state of California. Its capital is La Paz. The surface of the country is mostly mountainous, the climate is dry, and little farming is done except in some of the valleys. Whale-fishing on the west coast and pearl fishing on the gulf are carried on to some extent; but mining enterprises have met with little success. Salt and orchil, a violet dye, are also obtained. The vintage of parts of the country is highly esteemed. Lower California was probably discovered by Cortés in 1536. In 1866 part of it was granted to the Lower California Company with considerable privileges. Cortés named it California, *i. e.*, Hot Furnace, on account of its heat. Population, 52,244.

**Caligula** (*kà-lĭg'ŭ-là*), **Gaius Cæsar Augustus Germanicus,** Roman emperor from 37 to 41 A. D., was born 12 A. D., the son of the popular Germanicus. In the camp he was nicknamed Caligula or Little Boot, from the soldier's boots which he wore. On the death of Tiberius he was appointed heir, together with the grandson of the emperor; but the senate made him sole emperor. At first he was lavishly generous and merciful, though at the same

time very sensuous, but he soon became mad, and his cruelty knew no bounds. He banished or murdered his relatives and many of his subjects, victims were tortured and slain in his presence while dining, and he uttered the wish that all the Roman people had but one neck, that he might strike it off at one blow. He built a bridge across the Bay of Baiæ, and planted trees and built houses upon it, that he might say he had crossed the sea on dry land. In the middle of the bridge he gave a banquet, and at the close had a great number of the guests thrown into the sea. He made his favorite horse a priest and then consul, and also declared himself a god, and had temples built in his honor. At length his subjects could stand him no longer. A conspiracy was formed against him, and he was assassinated.

**Calor'ic,** a hypothetical fluid formerly employed to explain the phenomena observed in the study of heat. When the temperature of a body was raised, it was supposed that caloric was added to the body; when the temperature fell, it was explained by saying that caloric had been taken from the body. Caloric was supposed to be indestructible, uncreatable and imponderable. In having no weight, it differed from ordinary matter. When heat was added to a body—such as melting ice or boiling water—without changing its temperature, the fact was explained by saying that the caloric became latent and inactive, so that it could not be detected by a thermometer.

**Cal'vary,** the Latin translation of the Hebrew name Golgotha, a skull. It is situated north of Jerusalem and outside the walls. The place took this name either from being mound-shaped like a skull or from its being the place of public executions It was the scene of the crucifixion of Christ, and his body was placed in a tomb in a garden near by. In Catholic countries the term Calvary is given to a mound or hill crowned with one and sometimes with three crosses, bearing life-like figures of Christ and the two thieves, and occasionally surrounded by figures representing those who took part in the crucifixion.

**Calve** (*kàl'vâ'*), **Emma de Roquer,** a soprano opera-singer, of Franco-Spanish origin, who has achieved great fame on the stage, was born in France in 1866. In 1882 she made her *début* at Brussels in Gounod's *Faust,* and since then her career has been one long triumph. Her chief successes have been in the rôles of Santuzza, in *Cavalleria Rusticana,* in *L' Amico Fritz* and in *Carmen.* She has made successful tours through most of the capitals of Europe, as well as through the chief cities of the United States.

**Calvert, Cecil.** See BALTIMORE, LORD.

**Cal'vin, John,** one of the most noted reformers of the 16th century, was born at Noyon, in Picardy, July 10, 1509. He was well-educated, directing his attention first to the study of law. While a law student at the University of Orléans, he first became acquainted with the Scriptures through a relative, Pierre Robert Olivetan, who was making a translation of them. He began preaching the reformed doctrines at Bourges. In 1533 he went to Paris, where the new doctrines were popular under the influence of the queen of Navarre, sister of Francis I. The king, however, soon took active measures against the new religion, and Calvin, with others, fled for their lives. He went to Basel, where he is thought to have prepared his *Institutes of the Christian Religion* and to have written the celebrated preface addressed to Francis I. He visited his native town, sold the home, and with a younger brother and sister set out for Strassburg. The direct road was dangerous, because of the armies of Charles V, and Calvin took a route that led him through Geneva. Here he met Farel, who was struggling to promote the Reformation in that city, and induced him to give up the journey to Strassburg and join with him in the Reformation. At first Farel and Calvin were successful in their work at Geneva. A Protestant confession of faith was drawn up and approved by the Council of Two Hundred, the largest governing board of the city, and made binding upon all the citizens. But the party opposed to their rule triumphed, and expelled Calvin, who then proceeded to Strassburg. Here he busied himself with his studies on the New Testament. He was, however, recalled to Geneva by the people, and after a 15 years' struggle his rule was firmly established. The condemnation of Servetus and his death by fire belong to this period of Calvin's life. His share in the tragedy is uncertain. It is certain that he forwarded to the authorities private documents which Servetus had intrusted to him, and also certain that he used his influence to have the mode of death changed. Calvin died at Geneva, May 27, 1564. Besides his well-known *Institutes of the Christian Religion,* he wrote commentaries on nearly all of the *Old Testament* and on most of the *New Testament,* except *Revelation,* so that he ranks as one of the greatest commentators.

**Calypso** (*kà-lĭp'sō*), in Greek legend, a daughter of Atlas, who dwelt in the solitary wooded isle of Ogygia far apart from gods and men. Odysseus (Ulysses) being thrown upon her island by shipwreck, she treated him kindly and promised to make him immortal if he would marry her. Though fascinated, he refused to desert his wife and his native island. She detained him,

however, seven years, and on his departure died of grief.

**Calyp'tra** (in plants), a loose hood which rests upon the apex of the spore-case of mosses. See MUSCI.

**Ca'lyx** (in plants), the outer set of floral leaves, each leaf being called a sepal. See FLOWER.

FORMS OF CALYX

**Camb'ium** (in plants), the layer of living cells between the wood and bark, which has the power of making additions to both. Such cells have the power of dividing and thus forming new cells, on the inside adding new wood cells, thus adding each year to the rings of wood, and on the outside new bark cells. Cells with this power of division are generally knows as meristematic cells, and cambium is merely a meristem which occurs between wood and bark. These delicate cells are exposed when bark is peeled from a tree, forming the glairy, mucilaginous substance which makes the line of easy cleavage.

**Cambo'dia,** a state in Indo-China under French control, on the lower course of the Mekong River, south of Siam. It is 220 miles long and 150 miles broad, with an area of 37,400 square miles, not including the region ceded to France in 1907 by Siam. Along the coast are several islands, one bay and but one port, Kampot. Its external trade is carried on mostly through Saigon in Cochin China. The mountains in the north and west contain iron, limestone, sandstone and some copper. The greater part of the country consists of plains of rich loam, which yield abundantly with almost no cultivation. The main river, the Mekong, flows through the country in a generally southwesterly direction. Great Lake has an area of 100 miles by 25, and its greatest depth is 65 feet. Rice, cotton, indigo, betel, tobacco, maize, cinnamon, pepper, sugar-cane, etc. are raised; and among the animals are the elephant, tiger, panther and rhinoceros. Crocodiles are found in most of the rivers. The people are tall and robust, copper-colored, with long skull, flat nose and eyes slightly oblique. They are, however, indolent and passive from long oppression and because of the little work required for subsistence. Fishing in Great Lake is the main industry. Lines of steamers ply on the Mekong. Pnom-Penh, the capital, has a population of 50,000. Here is a large school, with two French professors and a native teacher. The religion is developed from Buddhism, the worship of ancestors forming an important part. The language is much like those of Siam and Anam. The ancient kingdom of Cambodia or Khmer extended over a large part of Indo-China. In the 17th century it was dismembered, and Anam and, later, Siam acquired large portions of it. The Portuguese in the 16th century were the first Europeans to enter the country, and were followed by the Spaniards and the Dutch. In 1858 France first appeared in Indo-China, and in 1863 made a treaty with Norodom, king of Cambodia, by which Cambodia was placed under a French protectorate. Cambodia has now placed over it a resident-general under the governor-general of Indo-China. The most remarkable thing in Cambodia is the splendid ruins of the architecture of the Khmer kingdom. The temples, palaces and monuments scattered everywhere are wonderful for their size and artistic grandeur. In a single temple there are 1,532 columns. Among the ruins are also massive stone bridges, one measuring 470 feet in length, with 34 arches. The present inhabitants look upon these structures of their ancestors as the work of angels or giants. Population about 1,500,000. See COCHIN CHINA

**Cambon** (*kän'bôn'*), **Jules Martin,** French diplomat, and plenipotentiary to Washington in the interest of peace with Spain at the close of the Spanish-American war, was born in Paris in 1845. He served with distinction in the French army during the Franco-Prussian War of 1870, and later served his government as confidential adviser in Algeria, where he became (1891–97) governor-general. In August, 1898, he signed at Washington the peace protocol on behalf of Spain, and was rewarded by being made a commander of the Legion of Honor. His elder brother, Pierre Paul Cambon, is French ambassador in London.

**Cam'bridge,** a suburb of Boston, with which it is connected by a subway under the Charles River. Harvard University, for which the city is largely noted, is in Cambridge, and its fine buildings and its campus filled with beautiful old elm trees are among the most interesting sights in the city. Cambridge is also the seat of Radcliffe College and Massachusetts Institute of Technology. It has many points of historic interest such as the old elm tree under which Washington took command of the American army; the house in which the poet Longfellow lived and which once was Washington's headquarters; the home of James Russell Lowell; the church in which Lord Cornwallis is said to have stabled his horses; and Mount Auburn Cemetery, one of the most beautiful burial-places in America. Cambridge is now known as one of the principal industrial cities of New England. The leading industries are baking, the manufacture of automobiles, automobile accessories and other machine parts, printing, publishing and bookbinding, confectionery, musical instruments,

furniture and pianos. The first book published in the United States was published in Cambridge. The public schools are among the best in the country, and the city has an excellent free public library well-stocked with books. Cambridge was settled in 1630 by Governor Winthrop and other prominent men. The first ministers of the place, as well as most of the educated men, were graduates of Cambridge University, England. The American army was encamped here during the Revolution, while the British had possession of Boston. The tax for wooden palisades around Cambridge in 1632 led Watertown Township to make the first protest in America against taxation without representation. Population, 111,000.

**Cam'bridge, Ohio,** a city and county-seat of Guernsey County, 55 miles north of Marietta. In the surrounding region are coal, pottery-clay and natural gas. Cambridge manufactures glass and pottery, iron and steel products. The city is served by two railroads and suburban electric line, was settled in 1804, and incorporated in 1887. Population, 15,000.

**Cam'bridge, Ada.** See CROSS, MRS. GEORGE FREDERICK.

**Cam'bridge, University of,** an English seat of learning in the city of Cambridge, on the river Cam, 58 miles north of London. Tradition places the beginnings of the university as far back as the 7th century; but its definite history begins in the 12th century. Like Oxford, it differs in many ways from the universities of the European continent and of the United States, but especially in what is called its college-system. It is at present made up of 18 colleges, each of which has its special students, teachers and governing body, but is at the same time subject to the general laws of the university. The governing body of the university is the senate, which is made up of graduates who possess the degree of Master of Arts, which is had without examination about four years after graduation. The relation between the colleges and the university is much like that between the individual states of this country and the Union as a whole. The course in any college covers three years, during which the students are called freshmen, junior sophomores and senior sophomores. The students are also divided into four classes, each class paying a different tuition; noblemen, fellow commoners, who receive their name from the privilege of dining or "having their commons" at the table of the fellows of the university; the pensioners; and the sizars. The sizars formerly had to do all sorts of menial tasks; but this practice has ceased. While there is a rivalry between the different colleges, all unite and act as a university, and are known not as members of the different colleges, but as "Cambridge men." There are now about 126 of a teaching staff, including readers, assistants, etc., and the students number a little over 3,200. There are over 400 fellowships, the fellows being elected from those who have distinguished themselves in examinations. The university sends two members to Parliament, who are elected by the senate. Women are admitted to the examinations for honor students, and reside mostly in Newnham and Girton Colleges. There are a number of fine buildings, the chief being the senate house, the university library with over 400,000 volumes, the Pitt press, the observatory, besides the gardens and the museums. The old Gothic chapel in King's College is of remarkable beauty. Among the eminent men who have studied at Cambridge are Chaucer, Bacon, Spenser, Ben Jonson, Milton, Dryden, Newton, Pitt and Byron.

**Cambyses** (*kăm-bī'sēz*), king of the Medes and Persians, the son of Cyrus the Great, who became king in 529 B. C. He added Egypt to the Persian territory, but an army which he sent to take possession of the temple of Jupiter Ammon perished in the desert, and another army which he led against the Ethiopians was depleted by hunger and disease. These disasters seem to have made him a madman. He killed his brother Smerdis and one of his sisters, and treated the Egyptians with great cruelty. But a revolution arose, and one of the Magians assumed the character of the murdered Smerdis and seized the Persian throne. Cambyses marched against him from Egypt, but died on the way, in Syria, from an accidental wound in the thigh, in 522 B. C.

**Cam'den,** county-seat of Camden County, New Jersey, lies on the Delaware River opposite Philadelphia, with which it is connected by several steam ferries. It is the terminus of a number of railroads, has extensive shipyards and immense market gardens. It also has foundries, cotton and woolen mills and manufactures of machinery, iron works, paints, oil-cloths, boots, shoes, etc. There are many public-school buildings, a private and a public high school, hospitals, churches, etc. Camden has three national banks and all the adjuncts of a modern city. The rapid growth of the city in recent years is shown by the increase of population from 58,813 in 1890 to 75,935 in 1900. Population, now, 94,538.

**Camel,** a cud-chewing animal of the Old World, especially adapted by nature to travel waste deserts with scarcity of food and water. They therefore are of great use to man, both as baggage carriers and for riding. There are two kinds, the dromedary or single-humped camel of Arabia, Syria and Africa, and the Bactrian camel with two humps—native of Asia.

The feet are provided with a spongy pad, that makes them well fitted to travel over the soft, yielding sand and also especially sure-footed in other localities. The hump is a special provision of nature for prolonged periods of fasting. It is only during a part of the year that the camel has abundant moist food; this is taken in greater quantities than is needed for immediate uses, and the rest is stored in the hump in the form of fat as reserve food. This is drawn on when food is scarce. The camel will pick up a living where other animals would starve, even dry twigs being chewed and turned to account as food. The walls of the stomach are provided with small pockets, in which water is stored, and they can travel several days in the hot, dusty desert without drinking. Camels are further adapted to desert travel by their nostrils, which can be tightly closed against sand storms.

1 and 2 Arabian Camels and Camel drivers. 3 Bactrian or two-humped Camel.

The average value of a baggage camel among Sudanese Arabs is about $15, but a good riding dromedary is worth from $50 to $150. The motion of the ordinary camel is said to be very trying, but that of the best riding kinds is easy and soothing. The latter are also swifter. They go, ordinarily, 50 miles a day for five days consecutively, but, when pushed, can cover more ground. The baggage camels are slower. In Africa they are expected to carry five or six hundred pounds' burden, and march 25 miles a day. It is expected that they shall be watered after four days' travel. They are not docile and patient, as those who do not know them are disposed to believe, but perverse and stupid. They will eat poison herbs and bushes, if not closely watched, and, although they kneel to be loaded, they complain and groan as the burden is laid on.

The Arabian dromedary is ten or eleven feet long and seven or eight feet high at the shoulders. It has fine, reddish-brown hair, abundant around the neck, throat, and tail, but absent on the breast and knees, where the skin is naked and provided with pads. The Bactrian camel is easily distinguished from the dromedary by its two humps. It is domesticated and also known in a wild state or, at least, wandering at liberty. It is of larger size than the dromedary, and is found in Siberia, Tibet and China. A few years before the Civil War, some camels were imported by the government of the United States for use on the great American plains. They were neglected and allowed to run free. Some remnants of this importation are now found in parts of Texas, Arizona and New Mexico. The alpaca and llama of South America belong to the same family as the camels, but differ from their Old World relatives.

**Cam'elot.** Tennyson in *Idylls of the King* speaks thus of Camelot:

The dim rich city, roof by roof,
Tower after tower, spire beyond spire,
By grove and garden lawn and rushing brook
Climbs to the mighty hall that Merlin built . . .
And over all one statue in the mold
Of Arthur, made by Merlin, with a crown.

Camelot is the name that the minstrels and historians of the middle ages gave to a city that was situated in Mommouthshire, Wales, on the River Usk, where there are still the ruins of a great amphitheater and of baths, pavements, etc. Geoffrey of Monmouth (about 1150) supposed that this was the place where Arthur had held his court, for the people still call the amphitheater King Arthur's Round Table. Tennyson preserves the tradition. But, as a matter of fact, it is not likely that Arthur had much, if anything, to do with this city. It is called Caerleon, which means castle of the legion, and was so-called because the Romans, finding there a small British town, made it an army post for the Second Augustan Legion. It was a considerable town in Roman days, and after the Romans had gone it was the seat of a bishopric and abbey. It is now a village with about 1,000 inhabitants.

**Cam'eo,** an engraved gem in which the figure or subject is carved in relief. It is distinguished from an intaglio, in which the engraved subject is sunk or hollowed out like a seal. Probably dating back to the Egyptians, the art of cameo-cutting

DROMEDARY

TWO-HUMPED CAMEL

ALPACA LLAMA VICUNA

was brought to a high state of perfection among the Greeks. The stones used by the ancient engraver were agates, with varicus strata, and are known as onyx stones, the different kinds of strata giving rise to special names. Alternate layers of black and white make the simple onyx; white and ruddy brown make sardonyx; and white and gray make chalcedony, etc. Frequently there are three different colored layers, or the ground may be obtained in one color, the figure in a second and wreaths or other ornaments in the third. Cameos have been used not only for ornaments, but for adorning cups, vases, etc., and cups were often worked out of a single stone, around which was engraved a series of figures. A vast number of ancient cameos have been preserved. One of the most celebrated is the Gonzaga cameo, a sardonyx of three strata, now in the imperial cabinet of St. Petersburg. It represents Nero and Agrippina. One of the largest and most famous cameos is in the National Library at Paris, which represents Augustus and the princes of the house of Tiberius as they are being numbered among the gods. It contains 20 figures. Italian cameo-cutters introduced shell-cameos. Imitation cameos are made in glass of different colors, and are called pastes.

**Cam'era** is an Italian word meaning room, and is etymologically the same as the English word chamber. It has come to mean, however, only a portable dark box used by photographers. The front of this box is provided with a flange, into which is screwed a lens. The rear of the camera is made to receive either a ground-glass plate or a sensitive photographic plate, upon which the lens projects the picture which is to be photographed. In a typical camera the remaining four walls are made of folded leather and are called the bellows. This enables the operator to vary the distance between the lens in front and the plate in the rear. In recent times this typical camera has undergone many modifications. Some are made to fold up, some are made without bellows, some are made so small as to be carried in the pocket, while the spectroscopist at times uses cameras made entirely of metal, and at other times he converts an entire room of his laboratory into a camera.

**Cam'eron, Simon,** an American senator, was born in Pennsylvania, March 8, 1799. He was elected to the United States senate in 1845, and acted with the Democratic party. After the repeal of the Missouri Compromise he allied himself with the Republican party, and was again elected to the senate. His name was proposed for president in the Republican convention of 1860, and under President Lincoln he became secretary of war. After two years he resigned and was appointed minister to Russia. Again elected to the senate, he became chairman of the committee on foreign relations. In 1877 he resigned, and was succeeded by his son, J. Donald Cameron. He died June 26, 1889.

**Cameroon'.** See KAMERUN

**Camoens** (*kăm'ō-ĕns*), **Luiz de,** the greatest poet of Portugal, was born at Lisbon in 1524. His chief poem, the *Lusiads*, named from the fabled hero Lusus, who, in company with Ulysses, is said to have visited Portugal, is the national epic of the Portuguese. Camoens died in poverty in a public hospital in 1580.

**Camp Fire Girls,** an organization among girls, somewhat similar to the Scout movement among boys. Corresponding to "Scout Masters" are "Guardians of the Fire." To secure admission or advancement a girl must, among other things, learn to prepare and serve meals, mend garments, keep accounts, average at least half an hour daily outdoor exercise, name the chief causes of infant mortality in summer and how to deal with them, know what a girl of her age needs to know about herself; understand the principles of elementary bandaging and what to do in the following emergencies: Clothing on fire, person in deep water who cannot swim, one who has fainted, and how to deal with an open cut or a frosted foot. Girls from twelve to twenty are eligible for membership. There are organizations in every state and territory. The headquarters of the organization is in New York City, and Dr. L. H. Gulick, formerly director of physical training of the New York public schools.

**Campagna di Roma** (*căm-pän'yä*). See ROME.

**Campania** (*kăm-pān'ēă*) (Latin *Campus*, a plain), a volcanic but otherwise attractive district in Italy lying inland from the Tyrrhenian Sea, in the region of Naples, and covering an area of 6,289 square miles, with a population, by latest census (1911), 3,347,925. It was a province of ancient Italy, and today it embraces the districts of Caserto, Benevento, Napoli, Avellino and Salerno, extending from the region of the Volurno River on the north to the Gulf of Policastro on the south. The province, originally settled by people of Oscan race, was subsequently under Greek and Etruscan dominion, until it was overrun, in 340 B. C., by the Romans who called it *Campania Felix* (Happy Campania), in allusion to its great fertility and delightful climate and scenery, in spite of its ill-omened volcanic character and its stretches of sulphur fields. Mount Vesuvius, overlooking the beautiful Bay of Naples, is its most striking physical feature; while anciently it embraced Herculaneum and the gloomy Lake Avernus, the entrance, as the Romans averred, to

the infernal regions. The province was in the classic period traversed by the Appian Way The chief towns of the district are Naples, Salerno, Capua, Avellino, Benevento and Caserta. After Sulla's day the coast towns of Campania were much frequented by the *literati* and wealthy sybarites of ancient Rome. See CAMPAGNA DI ROMA (plain of Rome), under ROME.

**Campbell** (*kăm'bel*), **Alexander,** an American theologian, was born at Shane's Castle, Ireland, in June, 1788. After attending Glasgow University, he came to the United States and served as pastor of a Presbyterian church in Washington County, Pa. Later he became a Baptist, and as early as 1810 he adopted the Bible as the sole recognized creed of his church. But it was not till 1827 that he founded the Disciples of Christ, a church that grew rapidly and now has a large membership in America and foreign countries. His followers are also known as Christians, Church of Christ and Campbellites. In 1841 Mr. Campbell founded and became the first president of Bethany College, at Bethany, W. Va., which has 280 students. Besides his work as pastor and teacher, he founded and edited the denominational organ of his church. He died March 4, 1866.

**Campbell-Bannerman, Right Hon. Sir Henry,** G.C.B., M.P., head of the Liberal ministry in the British Parliament, was born in Scotland in 1836, and educated at Glasgow and Cambridge. He entered Parliament in 1868, and served for a time as financial secretary at the war office, and in Mr. Gladstone's administration was chief secretary for Ireland and secretary of state for war. In 1894–95 he filled the latter post, also, under Lord Rosebery; and in February, 1898, on the retirement of Sir Wm. Vernon Harcourt as leader of the Liberal party in the house of commons, Sir Henry was chosen to succeed him. In Dec. 1905, he became Liberal Prime Minister. His death occurred April 22, 1908.

**Campbell, Thomas** (born 1777, died 1844), a noted British poet, was born at Glasgow, and, as a student at the university there, was distinguished for his knowledge of Greek literature. His early poem, *The Pleasures of Hope*, gave him a name as a poet. He traveled on the continent, where he witnessed the battle of Hohenlinden, which forms the subject of one of his finest lyrics. He wrote, besides poems, articles for the magazines and papers and for the *Edinburgh Encyclopædia*, and also published a magazine. He was at one time lord rector of the University of Glasgow. He died at Boulogne, France, and was buried in Westminster Abbey, a Polish nobleman scattering dust on his coffin from the grave of Kosciusko. *Gertrude of Wyoming* and the short poem, *The Last Man*, are well known; but it is for his war lyrics that Campbell will be most remembered, such as *Hohenlinden*, *Ye Mariners of England* and *The Battle of the Baltic*.

**Canada.** Canada comprises the northern half of North America. Its southern boundary is the United States, on the east is the Atlantic, on the west the Pacific and on the north the Arctic Ocean. Its area is three and a half millions of square miles, about the same as that of the United States and nearly equal to that of Europe. The population is over eight millions or nearly one-quarter less than that of Belgium. From Halifax on the Atlantic to Vancouver on the Pacific is 3,740 miles by rail. From Victoria on the Pacific to Dawson on the Yukon River is 1,550 miles by ocean and river steamer and rail. From Fort William at the head of Canadian navigation on Lake Superior, by the water way of the Great Lakes and the St. Lawrence River, to the tidal seaport of Quebec is 1,400 miles, and from Quebec city to the extreme Atlantic coast, at the Straits of Belle Isle, is 850 miles. Its most southerly portion is in the latitude of northern Spain and Italy, and the most northerly portion is in the latitude of northern Norway.

*Older and Newer Canada.* The eastern and older part of Canada occupies chiefly a vast peninsula lying between the water-system of the St. Lawrence on the south and the Hudson Bay on the north. This peninsula is of very irregular shape, and is 2,200 miles in length from east to west, with a breadth of from 300 to 1,200 miles. The western or newer, and much the larger, portion of Canada is compact in form. It extends from the western end of the Great Lakes and the west shore of Hudson Bay to the Pacific Ocean, a distance of 1,500 miles, and from the United States boundary (the 49th parallel of latitude) to the Arctic Ocean, a distance of 1,600 miles.

The provinces and territories of Canada may be grouped as maritime, eastern, central, western and northern. Maritime: British Columbia, Nova Scotia, New Brunswick and Prince Edward Island. The easterly portion of the province of Quebec on the shores of the Gulf of St. Lawrence may be included as a part of maritime Canada. The eastern provinces are Ontario and Quebec, which lie along the St. Lawrence River and its Great Lakes, and extend along Hudson Bay as shown on accompanying map. The central provinces are Manitoba, Saskatchewan and Alberta, which occupy the prairie area lying between the wooded region of eastern Canada and the Rocky Mountains. The western or Pacific province is British Columbia, which lies between the Rocky Mountains and the Pacific Coast. Northern Canada is the territory lying between the northern limits of the eastern, central and western provinces, already mentioned, and the Arctic Ocean.

ARCTIC OCEAN
PACIFIC OCEAN
BANKS ISLAND
VICTORIA ISLAND
PRINCE ALBERT LAND
PRINCE OF WALES ISLAND
MELVILLE SOUND
NORTHWEST TERR.
ROCKY MTS.
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
YUKON TERR.
Mt. St. Elias
Mt. Vancouver
Mt. Fairweather
Mt. McKinley
Mt. Logan
Mt. Brown
Mt. Lyell
Mt. Thompson
Mt. Evans
Fort Yukon
Dawson
Fort McPherson
Fort Simpson
Fort Resolution
Fort Smith
Fort Chipewyan
Fort McMurray
Fort Churchill
Hudson Bay
Great Slave Lake
Great Bear Lake
Athabaska Lake
Lake Winnipeg
Lake Manitoba
Lake Winnipegosis
Lake Athabaska
Lake Wollaston
Lake Dubawnt
Lake Athabaska
Lake Superior
Lake of the Woods
Edmonton
Calgary
Prince Albert
Saskatoon
Moose Jaw
Regina
Winnipeg
Brandon
Portage la Prairie
Selkirk
Vancouver
Victoria
Seattle
Portland
Spokane
Tacoma
Helena
Butte
Dillon
Boise
Pocatello
Salt Lake City
Ogden
Carson City
Reno
Virginia City
Austin
Eureka
Ely
Denver
Cheyenne
Omaha
Council Bluffs
Sioux City
Sioux Falls
Pierre
Bismarck
Minot
Fargo
Grand Forks
Duluth
Minneapolis
St. Paul
Milwaukee
Chicago
Davenport
Dubuque
Yellowstone Park
Yellowstone River
Missouri River
Columbia River
Snake River
Colorado River
Rocky Mountains
Cascade Range
Coast Range
Sierra Nevada
Black Hills
Big Horn Mts.
Wasatch Mts.
Blue Mts.
Klondike Region
Great Falls
Billings
Miles City
Glendive
Huntley
Livingston
Bozeman
Missoula
Kalispell
Lethbridge
Medicine Hat
Swift Current
Moose Jaw
Prince Albert
Battleford
Edmonton
Calgary
Banff
Revelstoke
Kamloops
Nelson
Trail
Rossland
Grand Forks
Penticton
Vernon
Kelowna
Nanaimo
Victoria
Port Townsend
Olympia
Aberdeen
Hoquiam
Astoria
Portland
Salem
Eugene
Roseburg
Medford
Klamath Falls
Lake Abert
Warner L.
Goose Lake
Crater Lake
Mt. Hood
Mt. Rainier
Mt. Adams
Mt. Baker
Puget Sound
Strait of Juan de Fuca
Columbia River
Willamette R.
Snake River
Yellowstone Park
Yellowstone Lake
Big Horn
Sheridan
Gillette
Belle Fourche
Rapid City
Chamberlain
Dakota Jc.
Sioux Falls
Yankton
Norfolk
Omaha
Council Bluffs
Lincoln
Beatrice
Hastings
Grand Island
North Platte
Julesburg
Sterling
Fort Morgan
Greeley
Boulder
Colorado Springs
Pueblo
Trinidad
Las Animas
Lamar
Garden City
Dodge City
Hutchinson
Wichita
Topeka
Kansas City
St. Joseph
Atchison
Leavenworth
St. Louis
Chicago
Milwaukee
Madison
Green Bay
Marquette
Sault Ste. Marie
Duluth
Minneapolis
St. Paul
Winona
La Crosse
Dubuque
Davenport
Rock Island
Peoria
Springfield
Alton
Cairo
Memphis
Vicksburg
New Orleans
Galveston
Houston
Austin
San Antonio
El Paso
Albuquerque
Santa Fe
Las Vegas
Tucumcari
Amarillo
Lubbock
Abilene
Fort Worth
Dallas
Waco
Temple
Corpus Christi
Brownsville
Laredo
Eagle Pass
Del Rio
Sonora
Ozona
Big Spring
Midland
Odessa
Pecos
Roswell
Carlsbad
Artesia
Hobbs
Lovington
Clovis
Portales
Tucumcari
Las Vegas
Santa Fe
Albuquerque
Gallup
Flagstaff
Winslow
Holbrook
Show Low
Globe
Miami
Phoenix
Yuma
Tucson
Nogales
Douglas
Bisbee
Deming
Lordsburg
Silver City
Las Cruces
El Paso
Alpine
Marfa
Presidio
Del Rio
Eagle Pass
Laredo
Brownsville
Corpus Christi
Galveston
Houston
Beaumont
Port Arthur
New Orleans
Baton Rouge
Natchez
Vicksburg
Jackson
Meridian
Mobile
Montgomery
Birmingham
Atlanta
Chattanooga
Knoxville
Nashville
Memphis
Louisville
Cincinnati
Columbus
Indianapolis
Chicago
Milwaukee
Detroit
Toledo
Cleveland
Buffalo
Rochester
Syracuse
Albany
Utica
Binghamton
Scranton
Wilkes-Barre
Harrisburg
Philadelphia
Trenton
New York
Boston
Providence
Hartford
New Haven
Springfield
Worcester
Portland
Bangor
Augusta
Concord
Manchester
Burlington
Montpelier
Rutland
Albany
Troy
Schenectady
Utica
Rome
Oswego
Watertown
Ogdensburg
Plattsburgh
Lake Champlain
Lake Ontario
Lake Erie
Lake Michigan
Lake Huron
Lake Superior
Lake of the Woods
Lake Winnipeg
Lake Manitoba
Lake Winnipegosis
Lake Athabaska
Great Slave Lake
Great Bear Lake
Hudson Bay
Hudson Strait
Baffin Bay
Davis Strait
Labrador
Newfoundland
Gulf of St. Lawrence
Gulf of Mexico
Gulf of California
Gulf of Alaska
Bering Sea
Aleutian Islands
Kodiak I.
Alaska Peninsula
Unimak I.
Pribilof Is.
St. Matthew I.
St. Lawrence I.
Nunivak I.
Kuskokwim R.
Yukon R.
Tanana R.
Fairbanks
Nome
Kotzebue
Point Barrow
Wainwright Inlet
Cape Lisburne
Point Hope
Kotzebue Sound
Seward Peninsula
Norton Sound
Kuskokwim Bay
Bristol Bay
Cook Inlet
Anchorage
Valdez
Cordova
Prince William Sound
Kodiak
Juneau
Sitka
Ketchikan
Wrangell
Skagway
Dyea
White Pass
Chilkoot Pass
Klondike Region
Dawson
Whitehorse
Mayo
Stewart
Telegraph Creek
Atlin
Teslin
Carcross
Fort Selkirk
Fort Yukon
Fort McPherson
Herschel I.
Mackenzie R.
Liard R.
Peace R.
Athabaska R.
Slave R.
Great Slave Lake
Great Bear Lake
Coppermine R.
Bathurst Inlet
Coronation Gulf
Dease R.
Dease Lake
Stikine R.
Telegraph Creek
Glenora
Hazelton
Skeena R.
Prince Rupert
Queen Charlotte Is.
Vancouver I.
Nanaimo
Victoria
Strait of Juan de Fuca
Puget Sound
Olympia
Seattle
Tacoma
Bellingham
Everett
Wenatchee
Yakima
Walla Walla
Lewiston
Clarkston
Pullman
Colfax
Spokane
Coeur d'Alene
Kellogg
Wallace
Missoula
Kalispell
Whitefish
Glacier Park
Great Falls
Helena
Butte
Dillon
Bozeman
Livingston
Billings
Miles City
Glendive
Sidney
Williston
Minot
Devils Lake
Grand Forks
Fargo
Jamestown
Valley City
Bismarck
Mandan
Dickinson
Medora
Belle Fourche
Sturgis
Deadwood
Lead
Rapid City
Hot Springs
Chadron
Alliance
Scottsbluff
North Platte
McCook
Hastings
Grand Island
Kearney
Lincoln
Beatrice
Nebraska City
Omaha
Council Bluffs
Sioux City
Yankton
Sioux Falls
Mitchell
Huron
Aberdeen
Watertown
Brookings
Madison
Redfield
Pierre
Chamberlain
Winner
Gregory
Rosebud
Valentine
O'Neill
Norfolk
Fremont
Columbus
Grand Island
Kearney
Hastings
Lincoln
Beatrice
Nebraska City
Omaha
Council Bluffs
Sioux City
Yankton
Sioux Falls
Mitchell
Huron
Aberdeen
Watertown
Brookings
Madison
Redfield
Pierre
Chamberlain
Winner
Gregory
Rosebud
Valentine
O'Neill
Norfolk
Fremont
Columbus

Longitude West from Greenwich
80°
70°
60°
50°
40°
80°
DOMINION OF CANADA AND NEWFOUNDLAND
SCALE
Statute Miles, 280=1 Inch.
0 25 50 100 200 300 400 500
The Rand-McNally & Co.'s New 11 x 14 Map of Dominion of Canada and Newfoundland.
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BAFFIN BAY
DAVIS STRAIT
HUDSON BAY
HUDSON STRAIT
FOXE CHANNEL
FOXLAND
CUMBERLAND PENINSULA
HALL PENINSULA
Cumberland Gulf
Nettilling Lake
Amadjuak Lake
Frobisher Bay
Umanak Fjord
Disco Bay
Christianshaab
Holsteinsborg
Godthaab
Frederickshaab
Cape Desolation
Fredrikshaab
Cape Farewell
GREENLAND
EGEDES LAND
Cape Dan
Kinge Bay
Cape Lowenborn
Angmagsalik
Anterotik Fjord
Cape Searle
Durban I.
Cape Dyer
Merchant Bay
Exeter Sound
C. Walsingham
C. Mickleham
Cape Mercy
Cape Raper
Isabella Bay
Cape Kater
Cape Hooper
Cape Christian
River Clyde
Cape Hewett
Cape Walter Bathurst
Cape Graham Moore
Cape Bowen
Cape Alair
Scott Inlet
Eclipse Sound
Navy Board Inlet
Gifford River
Auridge Bay
Garry Bay
N. Ooglit
S. Ooglit
Ooglit Is.
MELVILLE PEN.
Boothia Gulf
Gloucester Strait
Lancaster Sound
Cape Horsburg
Cape Hotham
Cape Murchison
Hall Is.
Lok Island
Repulsion Island
Cape Best
Cape Chidley
Eclipse Harbor
Aulatsivik Is.
Cape Uivak
Hebron
Cape Mugford
Okkak
Point Manitou
Nenark Is.
Tusk
Gayeaulik
Cape Harrigan
Nain
Gull Is.
Byron Bay
Hamilton Inlet
Sandwich Bay
Cape St. Charles
Belle Is.
Cape Bull
Groais Is.
Bell Is.
White Bear Bay
Cape Freels
Indian Bay
Cape Bonavista
Bonavista Bay
Trinity Bay
Conception Bay
Harbor Grace
Cape Race
St. Mary's Bay
Placentia Bay
Fortune Bay
Burgeo Is.
Port aux Basques
Cape Ray
Codroy
Cape Anguille
Port au Port Bay
St. George's Bay
Bay of Islands
Humber R.
Deer Lake
Grand Lake
Lake Melville
Mokami R.
Nascaupee R.
Hamilton R.
Grand Falls
Hamilton Falls
Lake Melville
Kanairiktok R.
Kaipokok Bay
Nichikun Lake
Attikonak Lake
Attikonak Grand R.
Mistassini L.
Mistassini R.
Peribonka R.
Peribonka L.
Manouan L.
Manouan R.
Nekoubau L.
Nekoubau R.
Waswanipi L.
Waswanipi R.
Nottaway R.
Rupert R.
Rupert House
Fort George
Big River
Cape Jones
Cape Henrietta Maria
Sutton Mill Lake
Brant Is.
James Bay
Twins Islands
Akimiski Island
Hannah Bay
Cape Hope
East Main River
Fort Albany
Charlton Is.
Martin Fall
Moose Factory
Moose R.
Missinaibi R.
Mattagami R.
Abitibi R.
Lake Abitibi
Kenogamissi L.
Kenogamissi Lake
Biscotasing
Sturgeon R.
Sturgeon L.
Wanapitei L.
Wanapitei R.
Pimukan R.
Nbruandin R.
St. John R.
Chimoitimi
Roberval
Chambord Jc.
Beaupre
Riviere a Pierre
Three Rivers
Ste. Anne
Quebec
Lake St. John
Chicoutimi
Metabetchouan
Roberval & Saguenay R.R.
Lake Kenogami
Jonquiere
Arvida
Riviere du Loup
Rimouski
Metis
Matane
Mont Joli
Cape Chat
Gaspe Basin
Gulf of St. Lawrence
Magdalen Islands
Cape Breton Island
Sydney
Louisburg
Glace Bay
Port Hawkesbury
Strait of Canso
Canso
Antigonish
Pictou
New Glasgow
Truro
Halifax
Dartmouth
Windsor
Kentville
Annapolis
Digby
Yarmouth
Liverpool
Shelburne
Lunenburg
Sable Island
Bangor
Portland
Boston
Concord
Portsmouth
Newport
Providence
Hartford
New York
Brooklyn
Long I.
Jersey City
Albany
Troy
Syracuse
Rochester
Buffalo
Niagara Falls
Lake Ontario
Lake Erie
Lake Michigan
Lake Huron
Lake Superior
Lake St. Clair
Detroit
Toledo
Cleveland
Pittsburg
Williamsport
Harrisburg
Philadelphia
Trenton
Pennsylvania
Ohio
Michigan
Wisconsin
Minnesota
Dakota
Montana
Wyoming
Nebraska
Iowa
Illinois
Indiana
Kansas
Colorado
Utah
Nevada
Idaho
Oregon
Washington
California
Arizona
New Mexico
Texas
Oklahoma
Missouri
Arkansas
Louisiana
Mississippi
Alabama
Georgia
Florida
South Carolina
North Carolina
Tennessee
Kentucky
West Virginia
Virginia
Maryland
Delaware
New Jersey
Connecticut
Rhode Island
Massachusetts
Vermont
New Hampshire
Maine
Ottawa
Toronto
Kingston
Montreal
Quebec
Winnipeg
Regina
Calgary
Edmonton
Prince Albert
Saskatoon
Moose Jaw
Brandon
Portage la Prairie
Fort William
Port Arthur
Sault Ste. Marie
Sudbury
North Bay
Cobalt
Haileybury
Timiskaming
Cochrane
Moosonee
Fort Churchill
Fort Chimo
Fort Nascopie
Fort Hope
Fort Severn
Fort Albany
Fort Simpson
Fort Smith
Fort Resolution
Fort Providence
Fort Liard
Fort Nelson
Fort St. John
Dawson
Whitehorse
Atlin
Prince Rupert
Port Simpson
Victoria
Vancouver
New Westminster
Nanaimo
Kamloops
Revelstoke
Nelson
Rossland
Trail
Grand Forks
Kootenay Lake
Arrow Lake
Okanagan Lake
Shuswap Lake
Mount Robson
Mount Hooker
Mount Brown
Mount Edith Cavell
Mount Assiniboine
Mount Sir Donald
Mount Stephen
Mount Victoria
Mount Temple
Mount Lefroy
Mount Hector
Mount Goodsir
Mount Forbes
Mount Columbia
Mount Alberta
Mount Robson
Yellowhead Pass
Kicking Horse Pass
Crowsnest Pass
Rocky Mountains
Selkirk Mountains
Gold Range
Cascade Range
Coast Range
Queen Charlotte Islands
Vancouver Island
Strait of Juan de Fuca
Strait of Georgia
Puget Sound
Seattle
Tacoma
Spokane
Portland
Astoria
Columbia R.
Fraser R.
Thompson R.
Peace R.
Athabasca R.
Athabasca Lake
Great Slave Lake
Great Bear Lake
Mackenzie R.
Liard R.
Yukon R.
Klondike R.
Dawson
Whitehorse
Lake Bennett
Chilkoot Pass
White Pass
Skagway
Dyea
Juneau
Sitka
Ketchikan
Wrangell
Prince of Wales I.
Queen Charlotte Sound
Hecate Strait
Dixon Entrance
Alaska
Yukon Territory
Mackenzie District
Keewatin
Ungava
Labrador
Newfoundland
Prince Edward Island
New Brunswick
Nova Scotia
Quebec
Ontario
Manitoba
Saskatchewan
Alberta
British Columbia

West of the Rocky Mountains is Yukon Territory. In the redivision of Canadian territory (1912), Franklin, Mackenzie, and a portion of Keewatin were added to Northwest Territories, Ungava to Quebec and a portion of Keewatin to Ontario and Manitoba.

*Climate.* The vast extent of Canada necessarily involves a wide range of climatic conditions. Except on and near the ocean coasts, the general characteristic of the climate of Canada as compared with that of Europe is that the summer is shorter, warmer, and has less moisture, and the winter longer and somewhat colder than in corresponding European latitudes. It is bracing and healthy, and in all respects suited to the fullest development of the races of the British Isles and northwestern Europe generally.

On the Pacific coast, owing to the Japanese current, the climate is identical in temperature with that of the British Isles, which lie in the same latitude. The influence of this warm current on the Pacific coast extends eastward across the western and into the central provinces, so that the winter climate of the western part of the central provinces is considerably milder than that of the eastern part. On the Atlantic coast, and inland, the climate is colder than in corresponding latitudes of Europe, because of the Arctic current which flows southward along the coast.

*Surface.* The important physical features of Canada are its mountains, lakes, rivers, forests and prairies and the great inland sea of Hudson Bay. The Rocky Mountains extend from the United States boundary northward to the Arctic Ocean. They bound the central plains on the west, and are the highest of the several parallel mountain ranges of the western province. They contain immense deposits, and in the parallel ranges between the Rockies and the Pacific coast are to be found the precious metals in great abundance, especially gold. The Laurentian Range of hills extends from the Atlantic coast, at the Strait of Belle Isle, westerly and northerly, a distance of 2,300 miles, to the east end of Great Bear Lake near the Arctic coast. In the east the Laurentian Range divides the waters flowing south into the St. Lawrence from those flowing north into Hudson Bay, and in the northwest it divides those flowing westward into Mackenzie River from those flowing eastward into Hudson Bay. But midway between the St. Lawrence and Mackenzie water-systems, the joint waters of the Red and Saskatchewan Rivers break northward through the Laurentian Range by way of Nelson River into Hudson Bay. The Laurentian Range carries iron in great abundance, but no coal. Silver, nickel, cobalt and many other valuable metals are also found, although the region has as yet been very little explored.

*Drainage.* The Laurentian district is remarkable for its numerous lakes, and especially for the succession of great lakes, which, forming part of three separate river systems, lie almost continuously along its southern side all the way from the Atlantic to the Arctic. The many streams and rivers which have their origin in the Laurentian Range afford unlimited opportunities for the creation of water power, and more than replace the lack of coal for all purposes for which power is required. The St. Lawrence and its tributary, the Ottawa, are the great rivers of eastern Canada; the Red and Saskatchewan of central Canada; the Fraser and Columbia of western Canada; and the Mackenzie and the Yukon of northern Canada. The St. Lawrence, Mackenzie and Yukon are among the largest rivers in the world.

The forests of Canada are one of the greatest sources of the national wealth. Maritime, eastern and western Canada were entirely covered by forest, of which only a small proportion has as yet been displaced by settlement and cultivation. The northern part of central Canada is also very considerably forested.

The prairies, which comprise the southerly portion of the central provinces, lie in an irregular triangle formed by the 29th parallel and the United States boundary on the south; the Rockies on the west; and the Laurentian Range on the northwest. They are watered in the southeastern part by the Red River, in the south and west by the Saskatchewan, and in the northwest by the Athabasca and Peace Rivers, branches of the Mackenzie.

*Manufacturing and Commerce.* With her vast mineral, fish, timber and other resources Canada is destined to become a great industrial and commercial country. During the last ten years the growth of her manufactures has been marvellous. The record of foreign commerce for the past few years shows that Canada's foreign trade is increasing more rapidly, proportionately, than that of any other country. The rate of gain for a period of ten years has been 132 per cent. The total of Canada's exports in 1913 was $393,232,057, of which the amount to Great Britain was $177,982,002 and that to the United States $167,110,382. Total imports $692,032,392 in 1911. From the United States came $455,322,555 and from Great Britain $139,653,587. Much of the Canadian wheat is shipped direct to Europe. In 1913 the value of the wheat exported was $88,608,730; of flour $19,970,689; of cheese $20,697,144; and of pork, bacon and ham $5,731,474.

The total value of lumber exports in 1913 was $33,433,089, much of it going to Great Britain. Thirty-five mills are converting spruce into wood-pulp.

*Minerals.* British Columbia and Nova

Scotia are the chief mining provinces. Important mineral deposits are found also in Ontario and Quebec. Extensive coal areas have been found in western Canada, and new railways are continually opening additional territory.

In 1912 Canada's total mineral production was valued at $135,048,296. The value of the coal was about $36,019,044; gold $12,648,794; and silver $19,440,165.

The Vancouver Island (British Columbia) mines produce a coal of excellent quality. The coal deposits of Nova Scotia underlie an area of about 635 square miles. The chief workings are in the Sydney, Pictou and Cumberland fields. The Nova Scotia mines are the largest producers in Canada.

At Lethbridge, a town of 8,000 people, a mine has been opened on a large seam of bituminous coal, the output of which has been traced for many miles. The Estevan mines (in the Souris fields) and the Lethbridge mines supply the provinces of Manitoba and Saskatchewan. The coal-beds extend far down the Saskatchewan and northward into the valley of Peace River. It is no uncommon thing in this district to see the agricultural settler driving up to the pit's mouth for his household supply of coal, easily obtained at prices ranging from $1.00 to $2.00 per ton.

In Nova Scotia iron is found near the coal, thus permitting economical smelting. Large areas of iron-ore have been found north of Lake Superior in Ontario, in eastern Ontario, in Quebec and in Ungava. Large steel-works have been established at Sydney and Terrona, Nova Scotia, and at Sault Ste. Marie, Ontario. There are iron smelters at Rawdon (Quebec) and at Deseronto, Hamilton and Midland (Ontario). Nickel ores are of great and growing importance, particularly as there are only two producing localities of consequence in the world—the Sudbury district in Ontario and the French colony of New Caledonia. The Ontario mines contain enough ore to supply the needs of the world for all time. Most of the copper output of Ontario is produced as a by-product of nickel. In 1902 British Columbia produced about 30,000,000 pounds of copper, most of which was mined in the west of the Kootenay district.

Practically all of the first-quality asbestos that is marketed in the world is produced at the Thedford, Black Lake and Danville mines in southeastern Quebec. Large quantities of mica are mined in Quebec and Ontario. The Yukon placer gold-mines are producing more gold than any other placer mines in the world, and since the wonderful Klondike rush in 1897, when 60,000 people sought this far-away northern country, gold to the value of $100,000,000 has been taken out. One of the richest silver camps in the world is at Cobalt, Ontario. See YUKON and COBALT.

*Fisheries.* Canada has become the fishing ground of North America. On the Atlantic and Pacific are extensive fisheries, while countless lakes, with their tributary streams, teem with fish of the greatest value as food.

Hundreds of foreign vessels, including many from the United States, come to the Canadian waters to share in these treasures. It is estimated that 78,000 Canadian fishermen thus find employment. Their boats, nets and gear are valued at $11,500,000 and their annual catch at $29,629,000. There are, moreover, extensive waters yet unfished, which in the near future will add to the value of the catch.

The vast salmon industries on the Pacific coast are in some respects the most remarkable in the world. In the season when fish are running up stream, the flow of water actually is impeded in shallow places by their numbers. Standing on the bank, one sees the whole river red with the gleam of their sides. Canning factories are built on these streams, and each year 9,000,000 to 10,000,000 fish are canned.

Hudson Bay and the coast waters from the Ungava to Mackenzie River are the richest whaling grounds in the world. The walrus and many valuable fish, such as sea-trout, salmon and cod, are found in these waters.

The Department of Marine and Fisheries carries on fish-culture, introducing fish into new waters and preventing the exhaustion of the present supply. There are sixteen government-hatcheries which, in some years, distribute over 400,000,000 fry.

*Railways.* With the exception of the Intercolonial (1,463 miles) and the Prince Edward Island Railway (279 miles) all railways in Canada are owned by private companies.

The Canadian Pacific extends to Montreal and then crosses Canada, passing through the world's granary to Vancouver on the Pacific. Cities, towns and over 400 stations are passed *en route*. It also runs from Quebec to Montreal and on to Toronto. The system has a mileage of 11,507 miles, the only transcontinental railway in America under one management. Its steamers ply between England and Canada, and between Canada and China and Japan.

The Grand Trunk runs from Portland (Maine), on the Atlantic, westward to Montreal, through Ontario to Sarnia, and thence to Chicago. It passes under St. Clair River—the outlet of Lake Huron—by the famous St. Clair tunnel. With a mileage of 3,104 it reaches practically all Ontario. It has several famous bridges, the Victoria Jubilee at Montreal (over the St. Lawrence); the Niagara, the largest steel-arch railway-bridge in the world, just below the Falls; and also the International near Buffalo.

(See, also, CANADIAN NORTHERN RAILWAY and GRAND TRUNK PACIFIC RAILWAY, both to be transcontinental lines).

BOW RIVER VALLEY ALBERTA. CAN. ON CAN. PAC. RY

*Steamships and Canals.* There are several Canadian transatlantic steamship lines, notably the Allan, the Dominion and the Canadian Pacific. The Canadian Pacific steamers ply to China, Japan and Australia. There are also important lines on the lakes and rivers.

The magnificent St. Lawrence is the greatest water-way in the world. Canals have been built wherever the rapids obstruct navigation. Canada has spent nearly one hundred millions of dollars on her canals. On the Welland Canal alone (24 miles long) $28,000,000 have been spent.

The St. Lawrence has been so deepened as to allow the largest ocean steamers to sail up to Montreal. Above Montreal vessels of fourteen feet draught can ascend to Lake Erie, and from Lake Erie to Lake Superior 20 feet of water are available. By this route a vessel can load at an upper-lake port to over fourteen feet, lighter to this draught at the east end of Lake Erie (Port Colborne), and carry the remainder of her cargo to Montreal, 1,230 miles from Fort William.

*Water-Powers.* Canada's water-powers are certain to play a tremendous part in her industrial development. Many industries are now supplied with electrical power. It has been well said that the Laurentian Highland constitutes "a gathering ground for many large and almost innumerable small rivers and streams which, in the sources of power they offer in their descent to the lower adjacent levels, are likely to prove of greater and more permanent value to the industries of the country than an extensive coal field."

At Sault Ste. Marie the largest pulp-mill in Canada is operated by electricity locally developed. One hundred and seventy-five thousand horse-power has been developed. See NIAGARA FALLS, at which place the ultimate development of electrical power will reach 425,000 H. P. At that point many millions of dollars have been spent by the three power-companies. The city of Toronto, more than 80 miles distant, gets its supply from one of them. Within 50 miles of Ottawa there is an available water power energy of 900,000 H. P. That at Niagara Falls is six times as great.

*Schools.* The provinces control the schools, and each of them as to system and methods and machinery generally is working out its own ideal. The Royal Military College at Kingston, Ontario, is a Dominion institution. All the others are provincial or controlled by local corporations. Alberta, one of the new provinces, has made provision for a university of its own. McGill University, Montreal, is doing collegiate work in British Columbia. The elementary schools (public schools, common schools) are free all over Canada. Every province makes generous provision for their upkeep. There are more than 20,000 free public schools in Canada, and about 1,250,000 pupils attend them.

For the secondary schools (high schools, and some of these having a certain number of teachers who are specialists and a certain specified strong equipment, are called collegiate institutes) a fee is charged in some instances. Not a few of these even are free. In Ontario and Quebec especially there are several residential schools modelled after the great public schools in England (such as Harrow, Rugby, Eton) with large attendance and doing most useful work.

Canadians are proud of their universities. McGill and Toronto, for example, are well and favorably known the world over. These and other universities are specially referred to elsewhere in these volumes. The sketches of the provinces contain fuller details as to their educational work.

The educational work done by the five Dominion experimental farms is of great value and interest. The central farm is located at Ottawa (the capital); two are in the northwest (at Brandon and Indian Head); one at Agassiz (British Columbia); and one at Nappan (Nova Scotia). Specialists carry on experiments in all branches of agriculture, the results being published in bulletin form. During the last few years seeds and specimens have been sent out through the mails to about 200,000 farmers. Less than 15 per cent. of the total population of all Canada is illiterate. In 1910 $27,800,000 were spent for purposes of education, and there were 1,289,000 pupils registered.

*Population.* Canada now has a population of over eight millions. Two and one-half millions live in Ontario; over two millions in Quebec; nearly a million in the maritime provinces (New Brunswick, Nova Scotia and Prince Edward Island); over 1,300,000 in Manitoba, Alberta, Saskatchewan and the territories; and nearly 400,000 in British Columbia.

*History.* The territories which now constitute the Dominion of Canada came under the British flag at various times, some by settlement and others by conquest or cession. Nova Scotia (Acadia) was discovered by the Cabots, in the service of King Henry VII, in 1497. The colony of Halifax was founded in 1749. By the Treaty of Utrecht (1713) Acadia and the Hudson Bay Territory were acknowledged to be British territory. The Hudson Bay Company's charter, conferring right of government over the territory now known as the provinces of Manitoba, Saskatchewan, Alberta and the Northwest Territories, was granted in 1670. The old French colony of Canada was surrendered by the capitulation of Montreal, signed September 8, 1760, and with Prince Edward Island and part of the present province of New Brunswick, was formally ceded to Great Britain by

France under the Treaty of Paris, signed Feb. 10, 1763. Vancouver Island was acknowledged to be British by the Oregon-Boundary Treaty of 1846, and British Columbia was occupied in 1858.

As originally constituted, the Dominion of Canada was composed of the provinces of Ontario, Quebec, Nova Scotia and New Brunswick. They were united under the provisions of an act of the imperial Parliament passed in 1867 and commonly cited as The British North America Act 1867. Provision was made in the act for the admission of British Columbia, Prince Edward Island, the Northwest Territories and Newfoundland into the Dominion. Newfoundland alone has not availed itself of such provision. In 1869 the extensive region known as Rupert's Land, the Hudson Bay Territory and the Northwest Territories was added to the Dominion by purchase from the Hudson Bay Company. The province of Manitoba was set apart out of a portion of it, and admitted into the Confederation on July 15, 1870. On July 20, 1871, the province of British Columbia and on July 1, 1873, the province of Prince Edward Island, respectively, entered the Confederation. The provinces of Alberta and Saskatchewan were formed from the provisional districts of Alberta, Athabaska, Assiniboia and Saskatchewan, and were admitted to the Union as provinces on September 1, 1905.

The Dominion adopted the same form of government as existed in the mother-land. There are a governor-general appointed by the king to represent him, two houses of parliament and a cabinet. As each province has a legislature of its own to manage its local affairs, it is as if England, Scotland, Wales and Ireland had separate parliaments in addition to that at Westminster. Canada has thus become really a daughter-nation of Great Britain. The mother-land leaves her free to manage all her own local affairs.

For fuller details concerning Canada, her educational equipment and natural resources, see ONTARIO, QUEBEC, NOVA SCOTIA, NEW BRUNSWICK, PRINCE EDWARD ISLAND, MANITOBA, ALBERTA, SASKATCHEWAN, BRITISH COLUMBIA, MACKENZIE, YUKON, UNGAVA, LABRADOR and FRANKLIN.

**Canadian Northern Railway, The.** Its main line from Winnipeg to Edmonton enters the province of Manitoba on the east 160 miles north of the boundary, running across the province a little north of west and crossing the Regina-Prince Albert branch of the same road at Warman. It crosses the North Saskatchewan twice before leaving the province at Lloydminister, a noted English colony. The Prince Albert branch of this railway is further north, leaving Manitoba at its northwest corner and running almost due west to Prince Albert. The Regina-Prince Albert branch, recently acquired by this company, runs from Regina in a northwesterly direction *via* Saskatoon to Prince Albert.

**Canadian Pacific Railway, The,** crosses Canada from east to west. Its completion saw the beginning of the real development of Canada. It enabled those who lived in eastern Canada to realize that our western prairies and unexplored northwest comprise a rich tract of about 600,000 square miles. The train of inflowing settlement since 1900 has become a rush. Each year thousands of well-to-do immigrants from all lands reach this great fertile country *via* the C. P. R. Along its main line are rapidly growing cities, and its branch lines are bordered with thrifty and growing settlements. In three provinces alone crossed by this road, viz. Manitoba, Alberta and Saskatchewan, the population has grown from 420,000 in 1901 to 1,322,000 in 1911. The railway management is enterprising and progressive. Some years ago its directors decided to undertake the irrigation of a tract 30,000,000 acres in extent, 40 miles wide and extending 150 miles east of Calgary (Alberta). Construction was well-begun in 1904 on this work which, when completed, will be the largest irrigation system on the American continent. The settler pays 50 cents an acre for the water his land requires. About one third of the work is now satisfactorily completed. Along the main line of this road we reach North Bay, Port Arthur, Fort William, Kenora, Winnipeg, Brandon, Portage La Prairie, Banff, Regina, Kamloops, Medicine Hat and Vancouver and other well-known prosperous places.

The Canadian Pacific also has a magnificent steamship service on both oceans (Atlantic and Pacific). Its steamships on the Montreal-Liverpool route are palatial. It furnishes a highway round the world.

It has a coast fleet including 15 vessels plying between coast points from Victoria, Vancouver, Seattle, Nanaimo, Ladysmith, Crofton and Comox to northern British Columbia and Alaskan ports. Its royal-mail "Empress" liners make regular trips from British Columbia to China and Japan, and its Canadian-Australian boats serve Hawaii, Fiji, New Zealand and Australia.

**Canal,** an artificial water-course. Canals are used principally for navigation, but also for drainage, for irrigation and for supplying cities and towns with water.

Navigation canals are of two kinds: (a) ordinary canals which are only a few feet deep and are traversed principally by special canal boats and barges, and (b) ship canals which admit sea-going vessels. A canal must be built in a series of level stretches. Where a change of level is made, the boats are generally raised by means of locks, but sometimes by lifts and cars. Canals for inland navigation

have been used for many centuries. The Grand Canal of China was built in the 8th century, is 650 miles long and is still in use. Canal systems in Europe are very extensive. In Russia the system of canals was started by Peter the Great, and St. Petersburg is connected with the Caspian and Black Seas. Sweden has 800 miles of canals. Both Germany and Austria have their principal rivers connected by canals, and Austria has recently planned a large increase of its canals. The canals of Holland are almost the roads of the country. In Great Britain there are about 5,000 miles of navigable canals, so that every town in the island is within a few miles of navigable water. The first canal in the United States was built in 1793 around the falls of the Connecticut River at South Hadley, Mass. In the early part of the 19th century a very extended system of canals was planned, but of the 5,000 miles planned, less than 3,000 miles were constructed, and many of these have since been abandoned. This is due to the building of railroads and the great reduction in the cost of overland transportation in recent years, owing to improvements in railroad service. Most engineers are agreed that the ordinary canal can never be made to compete with the railroads in the United States. Now, however, the tremendous growth of the country's commerce has made it absolutely indispensable to improve all our waterways and make new canals. The railroads cannot carry the freight. An unofficial inland waterways commission appointed by the government in March, 1907, has made a careful study of the rivers and canals of the whole country. In May, 1908, the governors of all the states in the Union, together with private delegates from every state, conferred on the subject at Washington with the national government, and Congress is considering a bill to create an official inland waterways commission. Several of the canals built in the early part of the century are noteworthy on account of the effect they have had on trade relations. The principal of these canals is the Erie Canal, built by the state of New York and opened in 1825. It extends from Buffalo to Albany, connecting Lake Erie with Hudson River, a distance of 352 miles. Originally it was but four feet deep, but the canal system of the state has been extensively improved and the old Erie Canal is now a part of the waterway unofficially known as the "Barge Canal," which accommodates boats of 12-foot draft. Other notable canals are the Chesapeake and Delaware Canal (1824-29) and the Delaware and Raritan Canal (1831-34), which connect the cities of New York, Philadelphia and Baltimore.

Ship-canals are built to connect two bodies of water so as to shorten routes. The most notable of these canals is the Suez Canal connecting the Mediterranean and Red Seas. It was opened in 1869 and reduced the distance of water transportation between Europe and India from over 11,000 miles to about 7,500 miles, and caused a saving of 36 days in the journey. The canal is about 100 miles long, and had originally a depth of 26 feet and a width at bottom of 72 feet. The depth has been increased to 28 feet and the width to over 200 feet, so as to accommodate the enormous traffic. The total cost of the canal, including the approaches at both ends, is said to have been $100,000,000. Other notable ship canals are the Caledonian Canal (a minor ship canal), the Corinth Canal, the Kiel Canal, opened in 1895, 63½ miles long and connecting the Baltic and North Seas, the Manchester Ship Canal, the Panama Canal now under construction to connect the Atlantic and Pacific Oceans and the Welland, Huron and "Soo" Canals, the last of which has more traffic in seven months than the Suez Canal in a year.

Drainage-canals are for the purpose of carrying off the sewerage of cities. The most notable of these canals is the Chicago drainage canal connecting the Chicago River with the Illinois River by the way of the Desplaines River. The current in the Chicago River is thus turned backward and 300,000 cubic feet per minute are thus taken from Lake Michigan and reach finally the Mississippi River instead of the St. Lawrence. The cost of the work has been over $63,000,000, and owing to the effect of the current on navigation in the Chicago River, a large additional sum will have to be expended to enlarge the river channel to provide an additional inlet. It has been in the plans of the construction of this canal to make it a ship-canal, so as to connect Chicago with the Gulf of Mexico for large vessels, and as engineers who have studied the problems and prepared plans pronounce the project feasible, and the entire country is entering on an era of building canals and improving waterways, it is not improbable that this will be done.

**Canary Bird,** the most common yellow cage-bird, highly prized as a singer. It is one of the finches and is a native of the Canary, Madeira and Cape Verd Islands. In the wild state its plumage is gray or greenish yellow tinged with brown. The yellow color of tame birds is produced by special breeding. Mama Canary builds the nest and hatches the babies. Papa Canary does most of the work of feeding them. (Watch canaries; also robins and other wild birds.) Its powers of imitation are great, and it may be taught various notes and simple airs. Exceptionally good singers are kept by the trainers as instructors for the young ones. The breeding and training of this familiar

bird of the household are carried on extensively in the Harz Mountains in Germany, and also in northern England,

THE CANARY

Scotland and Belgium. The Harz canaries are famous songsters; the Saint Andreasberg birds are the most choice of all the canaries.

**Cana'ry Islands,** a group of islands which form a province of Spain in the Atlantic Ocean, off the northwest coast of Africa. The group (usually called the Canaries) consists of seven large and several small islets, with a joint area of 2,807 square miles—less than a fourth of Maryland—with a population of 419,809. Lanzarote, Fuerte-Ventura, Gran Canaria, Teneriffe, Gomera, Palma and Hierro are the main islands. The distance from the nearest one, Fuerte-Ventura, to the African coast is about 62½ miles. The coasts are steep and rocky, and mountains are scattered over the islands, the highest being the famous peak of Teneriffe, about 12,182 feet in height. Cones, craters, beds of pumice and streams of lava show that all the islands are volcanic, though eruptions have been known in history in only three of them. There are no rivers, and on several of the islands water, which is supplied by springs, is very scarce. Over 900 species of wild flowering plants have been found on these islands, of which 420 are peculiar to the group. The lower lands produce sweet potatoes, bananas and other native plants of hot climates, while above, to the height of about 3,000 feet, the vine and various grains are raised. Some of the towns are becoming resorts for invalids, and the whole group of islands is being opened up. Harbors are being built, where many steamers touch, and telegraph cables connect the islands with Europe and Africa. The Canaries are believed to have been the Fortunate Islands of the ancients. The Greeks and Romans knew their position; but for many centuries they were lost sight of, until in 1334 they were rediscovered by a French vessel which was driven among them by a storm. They were occupied by Spain about the opening of the 15th century, and have been her possession ever since. The natural products of the islands are wine, sugar, vegetables and cochineal. The capital is Santa Cruz de Santiago, a seaport on the island of Teneriffe; population (1900), 38,419.

**Canby, Edward Richard Sprigg,** an American general, was born in Kentucky, in 1819. A graduate of West Point, he served in the Florida War, where he was twice brevetted for gallantry. At the outbreak of the Civil War, he was stationed at Fort Craig in New Mexico, where he displayed ability and energy in defending the fort against the Texan troops. He fought the battles of Valverde and Peralta, and was made brigadier-general.

GENERAL CANBY

After service in the war department and in putting down the draft riots in New York, he was made major-general and became commander of the armies west of the Mississippi. In 1865 he captured Mobile. After the close of the war he held several important and onerous positions, and in 1869 took command of the department of the Columbia on the Pacific coast. While holding a parley with the Modoc Indians, who were giving trouble, he was treacherously shot by a chief called Captain Jack, April 11, 1873.

**Candahar'.** See KANDAHAR.

**Candy-Making,** a large, varied and important industry in this and many European countries. About the middle of the past century a great impetus was given to the trade in the United States by the machinery designed for the manufacture of confectionery including the revolving steam-pan and lozenge-making machines, etc., which have largely displaced the making of candy by hand. As in other branches of trade, that of the confectioner and manufacturer of bonbons, nougats, caramels and the myriad varieties of sweets has in our modern day come under the influence of scientific methods in the candy-maker's factory.

**Cankerworm,** commonly known as inch or measuring worm, sometimes called fireworm, is a caterpillar, that is very destructive to fruit and shade trees. An army will devastate a large grove in a few days, sweeping over a locality like fire and leaving ruin behind. It was to arrest their work that the English sparrow was

brought into the country — with the unfortunate result familiar to all. There are two species: the fall cankerworm (*Anisopteryx*) and the spring cankerworm (*Paleacrita*, or *A. vernata*). The fall species lays her eggs after the summer birds have flown, and may come forth on an inviting, warm winter day. The spring species lays her eggs early in the spring, before many of the birds are back. The female is wingless, and crawls up the trunk of a tree to deposit her eggs on bark or twigs. To stop her progress, about the trunk of the tree should be fastened a band of coal-tar mixed with oil or printer's ink, which should be put on very early in spring and moistened when dry in winter. The winter birds are a valuable aid in keeping down the cankerworm pest; the chickadee is an especial enemy, eating immense numbers of eggs and also the female moths. With the bursting of the buds the eggs hatch, and when the larvæ get through devouring foliage they spin themselves down to the ground, burrow into the earth two or three inches, there undergo transformation, and come forth as moths in April, occasionally in March. See Hodge: *Nature Study and Life;* Cragin: *Our Insect Friends and Foes.*

**Can'næ** (*kăn'-ī*), a town of ancient Apulia in Italy, on the bank of the River Aufidus, now Ofanto, famous as the scene of Hannibal's greatest victory over the Romans, Aug. 2, 216 B. C. With about 50,000 men the Carthaginian leader took up his headquarters at Cannæ. The Roman consuls, Æmilius Paulus and Terentius Varro, at the head of a fresh army of 86,000 men marched against him. The consuls commanded on alternate days, and while Æmilius did not wish to risk an open battle with the victorious enemy, Varro on his day of command joined battle on the plains near the town. Hannibal skillfully forced the Romans to take up a position with their faces toward the sun and toward a fierce wind which blew the dust against them. In this plight he, with his veteran troops, quickly threw them into confusion, almost surrounded them, and completely cut them to pieces. His own loss was small. Æmilius fell in battle, but Varro partly atoned for his rashness by skillfully conducting the retreat of the remnant of the army to Canusium.

**Can'ning, George,** an English statesman and orator, was born in London in 1770. At college he showed ability as a writer and speaker. He entered Parliament in 1794, and his first speech made a marked impression. He also, in company with others, published the *Anti-Jacobin*, a political newspaper, in which he wrote the well-known poem, *The Needy Knife-Grinder.* He helped in the abolition of the slave-trade, was treasurer of the navy, and twice secretary of foreign affairs. His career as foreign secretary conferred lasting benefits on his country. He was subsequently made prime minister; but his health gave way, and he died at Chiswick Aug. 8, 1827, in the same room in which Fox had died 21 years earlier. He was buried in Westminster Abbey near the tomb of the older Pitt.

**Canning-Industry.** The principle of canning goods rests on the destruction of the bacteria of decomposition within the can and the keeping out of air through which such bacteria might come in. The purpose of canning was, in the first place, to preserve food; but now it is used largely to save people the trouble of cooking their food themselves. The number of canning factories is now counted by the tens of thousands; the number of people directly employed is probably near two millions. These include many children. The centers of fish and oyster canning are Maryland, Maine, Washington and Alaska. Fruit is largely canned in New York, Illinois and Virginia; beef in Chicago and St. Louis. The essential machinery of a canning factory includes the heating apparatus for boiling and scalding the material to be canned, and for blanching the vegetables; the exhaust apparatus for taking the air out of the can before sealing; and the heating apparatus for sealing the openings by which the air was removed. These operations are most profitably performed with the use of a great deal of machinery to handle large quantities with as few workers as possible. Other machinery is used for the special kinds of canning. In canning peas, the peas are taken from the pods by machinery and sorted into different sizes by machinery. Corn is taken from the cob and cleaned from the silk, etc., cooked and placed in the cans, all by machinery. In the case of soups and other liquids the cans are dipped and filled by the use of machinery. It therefore is possible to attain to great cleanliness and purity in the manufacture of canned goods, and by an act of Congress, passed in 1906, it is believed that a system of inspection has been established that will insure purity in all canned meats manufactured since that time. The canning industry has transformed our diet, making it possible to eat all kinds of fruit and vegetables at all times of the year without destroying the flavor by the use of sugar or other preservatives. The condensed-milk industry has made it possible to keep cows with profit at a great distance from towns, where there are no facilities for making and selling butter or cheese.

**Cannon** are arms or artillery that cannot be fired by hand but must be fired from fixed rests. They were first used in the 14th century. The first were clumsy, wider at the mouth than the chamber and

made of iron bars hooped with iron rings. The balls were first stone, afterwards iron. The early cannon had various names, as bombards or culverins; then they were named from the weight of the ball, as six-pounders; but now they are designated by the diameter of the bore, as 16-inch caliber, or by their weight, as a 25-ton gun. After the great wars of the 17th century vast improvements were effected in the manufacture and use of cannon, but these have been superseded by those of the 19th century, and the last have in turn seen themselves replaced by extraordinary improvements and inventions.

The interior of a cannon consists of the vent or breach, the chamber and the bore. The vent is the channel by which fire is brought to the charge, the chamber is the seat of the charge, the bore is the tube along which the ball passes. A cannon must fire accurately, destructively and rapidly without injuring the users. Its maker must provide for the strains caused by its weight and for the explosion's tendency to tear the gun. (Large, heavy cannon are known simply as guns.) The enormously increased weight and inertia of projectiles to-day and their swift rotation in rifled cannon try the gun so severely that steel is now used almost universally. Making a cannon begins by a draughtsman making figures and drawings of every size and with absolute accuracy. His work goes to a mill where steel-forgings are ready. The gun is to consist of a tube, a jacket over this and rings around the jacket. A huge forging is put on a lathe, perhaps 100 feet long, and the tube is bored out, oiled, tempered and rebored. This time the inside of the tube is cut with a spiral groove, the rifling, which, when the shell is fired, gives it a rotary motion, increases its range, steadiness and accuracy, and keeps the point in the direction of flight. Meanwhile the rings and jacket are made in a similar way. Putting these parts over the tube completes the gun. But all must fit as tightly together as if the gun were one solid piece of steel. This is done by playing off the cooling and contraction of metal and its heating and expansion against one another. The tube is kept cold, but the jacket is heated a day or two to 700°. Then the tube is stood upright, the hot jacket quickly slipped down on the cold metal, and the gun left to cool two days while the jacket shrinks tight. Finally, the gun is taken to a lathe again, and here, while it is in a horizontal position, the hoops or rings are shrunk on.

The built-up gun, as such a cannon is called, resulted from shrinking a hoop over the breech of an American cannon used in the Civil War. The hoop strengthened the gun so much that others were ordered and the process perpetuated. The wire-wound gun is a tube wound about with a ribbon or thin band of steel plate, great tension being used while winding. As ribbons of steel are much stronger than large hoops, the wire-wound cannon is stronger still than the built-up cannon.

Cannon are of various sorts. Guns are heavy cannon intended to throw solid shot with large charges of powder, and are distinguished from other cannon by their great weight and length and by the absence of a chamber. It is replaced by a breech-block, a mechanism that carries the charge into its place. The Vickers-Maxim breech is used in the great cannon of the American navy, and automatically ejects the exploded primer and raises the new load into position. Howitzers are light, short cannon used in battles on land to throw shells into the enemy's ranks at short distances. Mortars are still shorter cannon with a large bore, and are used to throw bombs or shells into the air, so that they will fall into fortified places. Shell-guns are long cannon used for shooting shells straight at an object. Cannon are also divided into smoothbore and rifled cannon, though few smoothbores are now in use. Cannon are made of iron, steel and bronze or brass. Heavy cannon are now made in a great many different shapes. One of the largest kinds now used in the forts of the United States is the Rodman gun. Some of these guns are so large that they will carry a ball 20 inches in diameter. The Armstrong gun is one of the best modern heavy guns. It has been made as large as 13½-inch caliber. The Krupp guns have become celebrated because of their enormous size and great durability. They have been made weighing over 120,000 pounds. The gatling gun is a machine-gun, constructed with ten barrels, which are revolved around an axis by a handle. As each barrel comes to a certain point, a cartridge is pushed into it by a machine and fired. As many as 400 shots can be fired in a minute and with great range and precision. Some of the most powerful modern cannon are sighted for 8,700 yards, and at that distance may be relied upon to strike an object ten feet high. In battle, however, fire is rarely opened at a greater distance than 3,000 yards. Gathmann and Zalinski invented pneumatic guns, using compressed air, to throw shells three miles that contained 100 lbs. of dynamite or 500 of guncotton, but they did not succeed in real war. Machine-guns and revolving and siege cannon are now the most important kinds of cannon. The possibility of transporting the huge guns—mortars with eleven-inch diameters firing shells weighing 500 pounds and more—was first demonstrated by the Germans at the siege of Liege and Antwerp which were soon reduced under their terrific fire. Owing to

the enormous recoil of these guns it is necessary to build special concrete foundations before beginning operations. Disappearing guns are cannon in which the force of the recoil pulls the cannon back, lowers it into position for reloading and then returns it to position for firing. Thus there is perfect protection from the enemy. They are an American invention for use in forts whose location it is desired to hide, the Buffington-Crozier being the type most liked. Among coast and field guns the most effective, all-around cannon is the 8-inch rifle that fires a 250-lb. projectile about 18 miles and can discharge six aimed shots a minute.

**Cannon, Joseph G.,** was born in Guilford, N. C., of Quaker parentage, May 7, 1836. His family moved to Illinois. Working in a country grocery, he studied until he was prepared to pass the examination which permitted him to practice law in that state. From 1861 to 1868 he was states-attorney for Vermillion County, Illinois, and was elected congressman for the 12th Illinois district in 1873. He served in Congress from 1873 to 1891, and from 1893 to the present, failing of election only in the year when the whole country turned to Cleveland and the Democratic party. He was chairman of the committee on appropriations, for the 55th and 56th congresses. In 1903 he was elected Speaker, holding that office until 1911. He now lives in Danville, Illinois. His energy, which he preserves in spite of his age, his kindly nature, his reputation for honesty and his inflexible opposition to extravagance in national expenditure have made him popular in spite of his aggressive partisanship and his stern insistence on order in the House.

**Canoe** (*kă-nōō'*), originally a light, narrow boat made of the hollow stem of a tree, or of bark, and moved by paddles. Those hollowed out of a tree-trunk are called dugouts. The American birch-bark canoe is light and frail-looking, but very useful. In building it, a skeleton is first made of light wood, the casing of birch-bark is put on crosswise, and the strips sewn together with the fibrous roots of fir trees, while the seams are dressed with gum. It has no keel and neither stem nor stern, but runs to a point at either end; and neither nails nor pegs are used in building it. The birch-bark canoes of South America and the native Australian gum-tree bark canoe are made of one piece of bark. Esquimaux canoes are generally made of seal or walrus skin, stretched over whalebone; and some Labrador canoes have a round hole or well in the center for the canoeist, and are light enough to be carried on the head. Many of the Polynesian canoes are hollowed out of a single log; while others are made of planks cunningly fastened together. The largest Fiji canoes are 100 feet long, and double ones, 70 feet in length, can carry from 40 to 50 persons. Mr. Stanley on the Congo met a war-canoe with 40 men rowing on each side and ten in the bow, while eight men guided at the stern with ivory-tipped paddles. Canoes on the African inland lakes are sometimes made of reeds. The canoe has within recent years become popular in Europe and America as a pleasure boat. It is made of various materials, of tin, paper, India rubber, wood or canvas. The American Canoe Club has over 5,000 members. The *American Canoeist* is a magazine devoted to the interests of the sport.

**Cañon** (*kăn'yŭn*), a Spanish word meaning a tube or pipe, now in common use for a deep ravine or gorge worn by running water. Cañons are very numerous in North America. In many parts of the Rocky Mountains the streams have worked their way down through hundreds and, in some

MARBLE CAÑON, COLORADO RIVER

places, even thousands of feet. These cañons are of wonderful depth and size on the Colorado River, over the west slope of the Rocky Mountains. For 300 miles there is a nearly continuous cañon, from 4,000 to 7,000 feet deep. The rocks rear themselves in nearly vertical precipices on either side of the stream. In large parts of the cañon are numberless peaks and temple-shaped summits, and above the walls of the cañon rise plateaus and mountains piled up sometimes to an added height of 5,000 to 7,000 feet. In the interior of New York, near

the headwaters of Seneca Lake, are several remarkable cañons, of which the most noted is that at Watkins, known as Watkins Glen.

**Canossa** (*kȧ-nŏs'sȧ*), a small town in Italy, near Modena, is famous for its ruined castle, once the scene of the most dramatic incident, perhaps, in all history. For centuries the German emperors, who were regarded as the divinely chosen successors of the ancient Roman Cæsars, contested with the papacy for the mastery of the western world. It was held by both the popes and emperors that Christendom was divinely ordained to be one indivisible empire, which they called the Holy Roman Empire, and that the kings of the nations were no more than their feudal vassals. It was admitted in theory that the pope was the spiritual head of this empire, and the emperor its lay or secular or temporal head. But during centuries the rivalry of popes and emperors became from time to time the signal for war. The last resort of the papacy was to excommunicate an emperor and, in so doing, to array his own vassals against him. Partly by this means in 1077 Pope Gregory VII, known as Hildebrand, forced the German Emperor, Henry IV, to stand before the castle of Canossa during three days as a penitent, barefoot in the snow and clad only in a woolen shirt. This was an admission of the supreme power of the papacy which was never forgotten. Although Henry VI himself and, after him, other emperors resumed the ancient strife, the Holy Roman Empire became in the fourteenth century little more than an idea and a name. See Bryce: *Holy Roman Empire;* and Tout: *The Empire and the Papacy.*

**Canova** (*kȧ-nō'vȧ*), **Antonio,** an Italian sculptor, was born in 1757, at Possagno, a village in Venetian territory. In boyhood he showed great talent in modeling, and spent many years in studying his art. His genius made him popular among his countrymen, and he was received with honor in many parts of Europe. He was made a marquis and given a pension. Among his earlier works, *Theseus with the Minotaur* established his reputation; and *Cupid and Psyche, Venus and Adonis, Penitent Magdalen, Palamedes* and *Perseus with the Head of Medusa* are celebrated works. He modeled a number of statues and busts. Among his later works was a colossal statue of Washington, in a sitting attitude, which was bought for the state house in Raleigh, North Carolina, but was destroyed by fire in 1831. Canova made a large fortune, which was almost entirely expended in works of charity. He was especially liberal to artists, and endowed all the academies in Rome. He died in 1822.

**Canrobert** (*kȧn'rō'bâr'*), **Marshal François Certain,** a French general and senator, born in 1809, and died in 1895. He held a command in the Crimean War, under Marshal St. Armand; but, disagreeing with the British allies, he was superseded by General Pélissier. In 1859 he took part in the war with Italy, and distinguished himself at Magenta and Solferino. In 1870, in the Franco-German war, he and his force were shut up in Metz and had to capitulate. In later life he was a member of the French senate.

**Can'teen, The Army.** A canteen is literally a soldier's drinking cup; the term is applied to a shop under the control of the military authorities where refreshments are sold and amusements afforded the soldiers. The refreshments have in practically all cases consisted largely of alcoholic beverages. In the American army the canteen or post exchange had for many years supplied the troops, at reasonable price, with such articles, the articles of ordinary use, wear and consumption, as were not supplied by the government, and afforded them "means of rational recreation and amusement, suitable to their station in life, which, if denied, they would seek outside the limits of the camp." "Every enlisted man is a stockholder in it." In practice the profits were derived largely from the sale of beer and light wines. In 1901 the Women's Christian Temperance Union and other advocates of total abstinence secured the passage by Congress of a law prohibiting the sale of intoxicating drinks in any post-exchange or canteen or army transport. As a consequence most of the army-canteens were closed, apparently for the reason that without the profits on the sale of beer and wine they could not be operated. Congress therefore in 1902 and again in 1903 voted $500,000 in aid of such canteens. But the army has not, it seems, to any considerable extent availed itself of this provision.

**Can'terbury Cathedral,** one of the finest cathedrals of England, stands in the city of Canterbury, fifty-six miles southeast of London. The occupant of the episcopal see of Canterbury is primate of all England. The foundation of the cathedral dates back to the year 596, when St. Augustine consecrated there an old Roman Christian church under the name of Christ's church. It was burned in 1067 and again in 1174, and finally in 1872 was damaged by fire. During its long existence, it has been altered, beautified and enlarged. The length of the building is 532 feet and its greatest breadth 154 feet. The great tower, 230 feet high, is of remarkable beauty. The stained-glass windows are of the richest colors, and the crypts or chambers beneath are the finest in England and contain several chapels. Before the high altar the famous archbishop, Thomas à Becket, was murdered in 1170. About the year 1500 the yearly offerings at his shrine amounted to $20,000, and when the shrine was torn down in the 16th century its treasures filled twenty-six carts. The stone steps leading to it were worn by the knees of countless pilgrims. There are many monuments in the cathedral,

including those to the memory of Henry IV and the Black Prince. Near by is Kings' School, founded by Henry VIII, where David Copperfield, of Dickens' creation, went to school.

**Can'ton,** called also Yang-Ching, "the city of rams," a large city in the south of China and capital of the province of Kwang-Tung, lies on the bank of the Shu-Kiang or Pearl River. The city is surrounded by walls from twenty-five to forty feet high, twenty feet thick and six miles around. A wall running east and west divides it into the old and the new city. There are many gates shut and guarded by night, named Peace Gate, Eternal Rest Gate, etc. Across the river are the *hongs* or European quarter, separated from the river by a quay, 100 yards wide. There are more than 600 streets, generally less than eight feet wide and very crooked. Ancient barricades inclose each street, and in the principal streets night watchmen in watchtowers.

proclaim the hours and sound fire-alarms. Property is so insecure that every shop which contains anything valuable must be barricaded at dusk, so that it can stand a siege, and all business must cease at sunset. There are two pagodas, one erected ten centuries ago, the other over thirteen centuries ago, and nearly 150 other temples or joss-houses One of the largest temples covers with its grounds seven acres and has 175 priests attached, and the temple of "Filial Duty" has 200 priests. The priests and nuns together in Canton number over 2,000, most of them being Buddhists. The "Temple of Five Hundred Genii" has 500 statues in honor of the Buddha and his disciples. Examination Hall covers sixteen acres, and has 8,653 cells. Nearly half the craft on the river are utilized as fixed residences, with a floating population estimated at 200,000. Tea, silk, sugar and cassia are the chief articles of export, and the chief imports are cotton, wool, metal goods, food stuffs, opium, kerosene, etc. Over 3,000 ships enter and clear the port yearly. Canton has long been a favorite port with foreign merchants. Its earliest annals date back to 200 B. C. In 700 A. D a regular market was opened and a collector of customs appointed, and 200 years later the Arabs made regular voyages thither. The Portuguese found their way to it in the 15th century, and the Dutch 100 years later These in turn were overtaken and overthrown by the English before the close of the 17th century, and an immense trade was carried on by the agents of the East India Company. The city was captured by French and English forces in 1857, and was garrisoned by them until 1861. The exports of Canton (chiefly of tea, silk and sugar) were valued in 1005 at 37 million *taels*. (The *tael* is about $1.40.) Estimated population, about one million.

**Canton,** the county seat of Stark County, Ohio, is 102 miles west-northwest of Pittsburg, 54 south-southeast of Cleveland. It has three railroads, the Pittsburg, Ft. Wayne & Chicago; Wheeling & Lake Erie; and Cleveland Terminal & Valley. It is situated in the center of a rich farming country, and is surrounded by rich deposits of coal and limestone. It has a number of important manufacturing concerns, including Aultman & Co., manufacturers of farm implements, Canton Rolling Mill, Canton Steel Company, American Bridge Company, Harvard Dental Chair Company, Gould Dental Chair Company and Dueber-Hampden Watch and Case Company. It contains two parks and is connected by electric railway with a beautiful lake resort. It has three daily and four weekly newspapers; twenty-three churches; ten banks; a hospital; eighteen school buildings, with 7,200 school-children enrolled. President McKinley's home was at Canton.

Its large manufacturing interests have been chiefly instrumental in its rapid growth from a town of less than 10,000 in 1870, to a city of 65,000, at the present time.

**Canute** (*kā-nūt'*) or **Cnut,** called the Great, king of the English, Danes and Norwegians, was born about 994. His father, Sweyn, king of Denmark, died in the midst of his conquests in England, and Canute immediately began a struggle for the English throne. He landed with a powerful force and soon overran a large part of England. The struggle ended by the division of the country between Canute and the Saxon, Edmund Ironside, while the death of Edmund in 1017 gave the whole kingdom to the young Danish conqueror. He put to death some of the more powerful English nobles, but from this time onward, until his death in 1035, his character seems to have been completely changed. At once he laid aside his ruthless, revengeful temper to become a wise, temperate, devout and law-abiding ruler. He made a pilgrimage to Rome, and wrote back a letter to his subjects which shows the noble simplicity of his character and the high idea he had formed of the duty of a king. The death of his elder brother brought him the

throne of Denmark, and that of Norway soon followed. Canute gave England eighteen years of peace and order, but at his death his kingdom fell to pieces, as it had depended upon his own personal greatness. A story is told of how this monarch rebuked the flattery of his courtiers, who had said that all things were possible to him. He had his chair placed on the seashore while the tide was rising, and when the water came near him, he ordered it to go back and not to wet him who was lord of the sea. But the water soon wet his feet, and turning to his courtiers, he said: "Let all men know how empty and worthless is the power of kings; for there is none worthy of the name but Him whom heaven, earth and sea obey."

**Canvasback** (*Aythya Vallisneria*), a North American freshwater duck, extensively found in marsh lands and river flats, where it can obtain its favorite food, the roots of the wild celery plant. It is largely found in Chesapeake Bay, in the Mississippi Valley and around the shores of Lake Huron and Lake Erie. Its breeding grounds are the far north, whence it comes southward late in autumn, and affords good game for the gunning sportsman, for it is expert in diving and rapid in its flight when pursued and shot at. A related bird is the redhead, often mistaken for the canvasback, though its plumage is brighter in color and it has not the latter's fondness for a celery diet. In length the canvasback is usually about 20 inches, with a blue-colored bill, the male bird having a reddish head, modified by dusky tints, with a dotted and lined coarse canvas-like back and sides. See DUCK.

**Cape Breton** (*brĕt'ŭn*), a rocky island in the shape of a triangle, in the Canadian Dominion, at the eastern end of Nova Scotia, and forming part of that province, from which it is separated by the Gut of Canso, one mile broad. Its greatest length is 100 miles, its width 85 miles and its area 3,120 square miles. The coast is indented with bays. The Bras d'Or, an inlet on the east, forms a lake 50 miles long and 20 broad, so that most of the interior can be reached by water. This lake is now continued by a ship canal to St. Peter's Bay, on the south coast, dividing the island into two parts. The main exports are timber, fish, iron ore and coal, and the soil yields grains. At first held by the French, Cape Breton was taken by the English in 1745, and in 1820 became part of Nova Scotia. The towns are Sydney, North Sydney and Port Hood. The once famous Louisbourg is now a mere village. Cape Breton sends two members to the Nova Scotian legislature. Its exports consist of coal, timber (pine and oak) and fish. Population of the whole island, including the district of Cape Breton, Inverness, Richmond and Victoria, 97,605.

**Cape Cod,** a sandy peninsula reaching into the Atlantic, and forming the southeastern extremity of Massachusetts. In form somewhat like the letter L, it is about 65 miles in length. There are many lighthouses upon the cape. On the northern end, called Race Point, is a revolving light, 155 feet above the sea At the head of the cape are forests of pitch-pine and oak trees. The numerous bays furnish many harbors, where are thriving villages which are nurseries of seamen. Cape Cod was discovered May 15, 1602, by Bartholomew Gosnold, who gave it its name from the quantity of codfish taken off its shores. On November 9, 1620, the *Mayflower* arrived at its coast, and the next day cast anchor in its harbor of Provincetown. Here was formed the famous compact which gave a government to the new colony. Bancroft called it the first of written constitutions. It, like our national constitution, was the creation of the people itself.

**Cape Colony** or **Colony of the Cape of Good Hope,** is a British possession at the southern extremity of Africa. It includes, East Griqualand, Bechuanaland and adjacent native territories, which have an area of 276,995 square miles. The area of the whole of British South Africa (including the now reannexed Transvaal and the Orange River Colony) together with Bechuanaland, Natal, Cape Colony and Rhodesia is estimated at 603,337 square miles.

*Surface—Drainage.* It has few navigable rivers or good ports. The principal harbor is Table Bay. Running parallel to the coast line and at an average distance from it of about 150 miles there is a range of mountains, forming the watershed of the country and known by various names as it stretches across the continent—Stormberg, Sneeuberg, Roggeveld Mountains. The eastern part of the colony is fairly well wooded and watered, and presents much beautiful scenery; the western part is covered with the karroo bush, which supports the large sheep farms.

*Climate—Irrigation.* The climate is one of the finest in the world, well suited to Europeans, and the Cape has long been known as a health resort. The scanty rainfall makes irrigation necessary. One vast reservoir, the largest in South Africa, draining 460 square miles, holds 35,000,000,000,000 gallons, and the extent of water surface is 19 square miles, with an average depth of ten feet. The climate and soil of the country are suited to the culture of vines, and in the southwestern part the vines produce heavier crops than are known almost anywhere else in the world. Dagga or wild hemp was smoked by the natives before tobacco was introduced, which is now widely grown.

*Animals—Flora.* The native animals were once numerous and varied, but are now nearly extinct. There still are a few elephants and buffaloes, and the beautiful springbok and smaller antelopes are still found, with baboons, monkeys, wildcats, porcupines, leopards, jackals and ant-eaters.

Among birds the secretary-bird, honey-bird and weaver-bird are peculiar. The iguana, cobra, puff-adder and other snakes abound, and the white ant covers the face of the land with its habitations, from two to four feet in height. It is probable that no single country has contributed so largely to the world's conservatories and botanical gardens as the Cape.

*Natural Resources.* Diamonds have been extensively found in the colony; while in Transvaal, at Johannesburg, not far from Kimberley, are the rich gold fields of the Rand. The Kimberley mine, the richest diamond-mine in the world, covers about twenty-five or thirty acres and has been sunk to a depth of over 600 feet. This mine, with three others, forming a circle of three and one-half miles in diameter, forms what is sometimes called the diamond fields. The finest diamond, the Porter-Rhodes diamond, was found in 1880, and is valued at $300,000. A yellow diamond, 428½ carats, as large as a hen's egg and said to be then the largest diamond in the world, was found in 1888. The largest yield from these famous diamond mines in any one year was in 1905, the value being over $32,000,000. Gold, copper, coal, iron and salt are found, besides valuable stones, such as garnets, agates and jaspers.

*Exports and Industries.* The principal exports are gold, diamonds, wine, wool, ostrich feathers, Angora hair, copper-ore and hides; the chief imports are cloths and dress goods, iron, leather manufactures, machinery, railway supplies and food and drink. More than three quarters of the trade is done with Great Britain and the British possessions. Besides the diamond-mines, the colony has many flour and saw mills, tanneries, breweries, tobacco factories and coach-building works. In 1904 there were 2,527 industrial establishments, employing 30,318 hands, with machinery and plant valued at more than ten million dollars.

*Education.* Education has not been made compulsory, and of the white population in 1904, twenty-two per cent could not read or write. There are a university and seven colleges in the colony, and 143 public libraries with a total of nearly 500,000 volumes. Private schools, generally under religious auspices, are aided by the government, the amount expended on education in 1904–5 reaching £447,796.

*Internal Improvements.* Over 3,180 miles of good roads and over 3,300 miles of railroads have been built throughout the colony. Four large bridges span Orange River, and two others cross the Kei and Vaal Rivers. Almost every town is in communication with Cape Town by telegraph, and there are nearly 1,100 postoffices.

*Cities.* The chief towns, with the inhabitants as estimated by the 1911 census, are Cape Town, 67,000; Cape Town and its suburbs, 169,641; Kimberly, 34,260; Port Elizabeth, 32,921; Graham's Town, 13,877; Beaconsfield, 14,000; Paarl, 11,28 King William's Town, 9,500; East London, 24,054; Graff-Reinet, 10,072; Worcester, 8,087; Uitenhafe, 12,199; Cradock, 7,762.

*Government and History.* The executive is vested in a governor, appointed by the British crown, with a legislative council and a house of assembly. In the Cape parliament speeches may be made both in English and in Dutch. There is a university at Cape Town, but no state-church. The capital is Cape Town; population, with suburbs, 169,641. In 1652 the Dutch East India Company took possession of the Cape and held it until it was turned over to the English in 1814. Its real growth dates from the British occupation. Since that time the establishment of responsible government in 1872, the emancipation of the slaves in 1838 and the Kafir and Boer wars have been the main events in the history of the colony. Population, 2,698,980, of which 2,028,104 are natives and the remainder whites. Unlike the aborigines of other parts of the world, the natives are constantly increasing. See BOER WAR for late history.

**Cape Hat'teras,** the most easterly point of North Carolina, separated from the mainland by Pamlico Sound. South of Delaware no land stretches so far into the Atlantic as does Cape Hatteras. Nor is any point on the coast more noted for its frequent and dangerous storms. The Gulf Stream flows within twenty miles of it. There is a lighthouse one and one fourth miles from the outermost point.

**Cape Horn,** the headland of an island in the Fuegian archipelago, commonly regarded as the southern extremity of America. It is a steep, black rock with bare and lofty sides. It was probably first discovered by Sir Francis Drake, in 1578; but it was first doubled by the Dutch navigators Lemaire and Schouten in 1616, the latter of whom named it after his native town of Hoorn. The cape is no longer rounded by steamers, which now always pass through the Strait of Magellan.

**Cape May,** a town occupying a point of land of the same name at the southern end of New Jersey at the entrance of Delaware Bay. It is a noted summer resort, the favorite watering-place for Philadelphians. It is connected with Philadelphia by the Pennsylvania and Philadelphia & Reading railroads, and in summer by several lines of steamers. The beach is over five miles long, and affords splendid drives. Population, 2,471.

**Cape of Good Hope,** a point commonly called the most southerly promontory of Africa, is really a little north of Cape Agulhas. It forms the turning point from south to east on the voyage from Europe to India. The cape is formed by the extremity of Table Mountain, which, as it recedes, rises from a height of 1,000 feet above the sea to 3,582 feet. It was discovered and doubled by Diaz, a Portuguese navigator, as early as

1486, when he was aiming to reach India, as Columbus by another route was aiming, six years later, to reach the same country. Because of the dangers he had passed through, he named it the Cape of All the Storms, but John II of Portugal renamed it Cape of Good

Hope. In 1497 Vasco da Gama rounded it on his adventurous voyage from Lisbon to Calicut. The result of the discovery of the route by the cape was not only to open a new channel for the traffic of the east, but also to remove the supremacy of trade from the republics of Italy to the states of western Europe.

**Cape Town,** the capital of Cape Colony, lies at the head of Table Bay, thirty miles north of the Cape of Good Hope, a southwestern extremity of Africa. It was founded in 1652 by the Dutch, and at first consisted of a few houses under the shelter of a fort. In 1806 it was occupied by the British. The houses of old Cape Town are mostly flat-roofed, oblong and whitewashed. A few church-towers and an occasional factory or mill-chimney break the monotony. Government house, the new and handsome houses of Parliament, the public library and museum, the fine-arts gallery, the railroad station, the old Town House and the old castle are the chief buildings, together with several banks, the buildings of the Supreme Court, an observatory, a cathedral, four or five colleges and an examining university without attached teaching institutions. The see-houses of the Anglican and Roman Catholic bishops are also here. There are many modern city improvements, such as water-works, gas, street-railroads. The breakwater and docks have given increased facilities to the shipping. The population of Cape Town proper is 67,000; including its suburbs, 169,641. See CAPE COLONY and CAPE OF GOOD HOPE

**Cape-to-Cairo Railway.** This great railway enterprise, in large measure due to the bequest left in the will of the late Alfred Beit, which is to connect Cape Town with Cairo through the whole length of the eastern regions of the continent of Africa, has of late been much advanced. Already the road now runs from Cape Town northward far beyond Broken Hill near the Zambezi River, a distance of over 2,100 miles, while the surveys have been completed as far as Lake Tanganyika and the southern frontiers of the Congo Free State. It is then projected northward past Lake Victoria into British East Africa; thence it will proceed to the Anglo-Egyptian Sudan; and it will connect at Khartum with the Sudan military railway now open to Cairo and the Mediterranean Sea. Other branch-roads are also projected, while the scheme, vast as it is, seems now to be taken out of the category of dreams.

**Cape Verd** (*vērd*) **Islands,** a group of islands, forming a Portuguese colony, in the Atlantic Ocean, off the African coast, 320 miles west of Cape Verd. There are 14 islands and several rocky islets, covering about 1,480 square miles. They are all of volcanic origin, and one, Fogo, still smokes. The shores are low, but in the interior there are high mountains. The rainy season lasts from the middle of August to November, but sometimes no rain falls for several seasons. In 1832, after a three years' drought, 30,500 persons perished. The fruits of southern Europe and western Africa flourish on the islands. Goats and asses are reared, and the most remarkable of the animals are monkeys and bisam cats. Poisonous reptiles are unknown. Salt is manufactured and exported to North America. The other products are coffee, millet and drugs. The natives are docile and lazy, though very religious. Roman Catholicism is the only religion. The population is 147,424, about one twentieth being whites and one seventh slaves. The latter are of mixed race, descended from Portuguese settlers and negroes of various tribes introduced from Guinea. Santiago is the largest island in the group; it is about 50 miles long and 23 broad at its widest part. The governor lives on the island, at the seaport of Porto Praia. The volcano of Fogo is 9,157 feet high. The islands were discovered in 1441 by the Portuguese, who have held them ever since.

**Caper'naum,** a town of Palestine, often mentioned in the New Testament and memorable as the scene of many of the miracles of Christ. Its exact site on the Sea of Gennesareth is uncertain. One possible site is a ruined village, known at present as Khan Minieh; another is three miles further off, at a spot called Tell Hum.

**Cap'illar'ity in Soils** refers to the ability of water to rise above the water-table toward the surface. The soil-particles act

as an absorbing medium, just as a lamp-wick does; the fluid in both cases passing up through the small spaces. The smaller the particles, and consequently the closer they are, the more effectively the water rises, just as in a glass-tube of very fine bore it rises better than in a larger tube. Tramping down the soil after planting small seeds presses the soil-particles together, and induces an upward flow of moisture that enables them to sprout. When the surface particles are compacted by sun-baking into a crust after the summer rains, the moisture easily passes into the air and is lost to the soil and the plant roots. On the other hand, breaking up this crust by cultivation forms a soil-mulch, whose larger spaces interfere with capillary action and prevent loss of moisture The so-called dry-farming of the semi-arid region is based on this principle, repeated cultivation being resorted to in order to conserve the moisture.

**Cap'itoline Hill,** one of the seven hills of ancient Rome. It was consecrated to Jupiter, and on it stood a temple of Jupiter, called the Capitol, and also the citadel. The foundations were laid by Tarquinius Priscus, one of the early Roman kings; but the building was not completed until the expulsion of the kings. It was three times burned and successively restored. In it were three shrines, to Jupiter, Juno and Minerva. At the porch of the temple the people were feasted on great occasions. Here were kept the important public documents. Other temples were built later on the hill to Mars, Venus, Fortune, etc. A library and other public buildings were also erected on the hill. At the south end was the Tarpeian Rock, down which state criminals were thrown headlong. In modern times the top of the Capitoline Hill forms what is known as the Piazza del Campidoglio, surrounded on three sides by palaces. A broad flight of steps leads up to the piazza, upon which are numerous statues. In the palaces are many objects of interest: statues, busts, galleries of pictures; the famous Bronze Wolf; a tomb on which are bas-reliefs telling the story of Achilles; and the well-known statues of the *Dying Gladiator*, the *Antinous of the Capitol* and the *Faun* of Praxiteles. In the hall of illustrious men are 93 busts of notable Greeks and Romans, and in the hall of the emperors is a series of 83 busts of emperors and empresses. The famous *Venus of the Capitol* is preserved in a cabinet, not open on public days.

**Capri.** See GARIBALDI.

**Caprivi** (*kā-prē'vē*), **Count Georg Leo von,** German general, statesman and chancellor (1890–94), was born in 1831 and died February 6, 1899. Entering the army in his 18th year, he won rapid promotion, and served with distinction in the campaigns of 1864 and 1866. In 1883 he was given command of the 30th division of the imperial army at Metz, and for a time was also at the head of the German admiralty and reorganized the navy. He was subsequently given command of the 10th or Hanoverian army corps, the finest in the German army. In 1890, on the fall of Bismarck, Emperor William made him his new chancellor and minister for foreign affairs. In October, 1894, owing to friction with Count Eulenberg over the agrarian malcontents, he resigned office, Prince Hohenlohe succeeding to the chancellorship.

**Cap'sule,** in botany a dry fruit composed of more than one carpel, which splits open to discharge its seeds. See FRUIT.

**Capua** (*kăp'pû-â*), a fortified city in Campania, Italy, on the River Volturno, 27 miles north of Naples. Ancient Capua was about three miles distant from the present city. It probably was founded by the Etruscans as early as 800 B. C. It fell under the sway of the Samnites and, later, of the Romans. Af er the battle of Cannæ it deserted to Hannibal, after whose defeat the city suffered severely. Capua was formerly a luxurious city, and was noted for its gladiatorial shows. It was from the school of gladiators here that Spartacus, with 70 companions, broke forth and organized the insurrection of the slaves. The city was overrun by the Vandals in 456 A. D., and finally destroyed by the Saracens about 840. A few years later, the inhabitants returned and built the present city. There still remain the ruins of an amphitheater capable of holding 60,000 people.

**Capuchins** (*kăp'û-chinz*), a mendicant order of Franciscan monks, founded in 1528; they derive their name from the cowl or stuff-cap (*caputium*) they wear. They live chiefly by begging, and go about barefooted, unshaven and generally garbed in brown or gray. The order is most numerous in Austria, and is not unknown in the United States.

**Carácas** (*kâ-rā'kâs*), the capital of the republic of Venezuela and of the federal district, is six miles from La Guaira, its port on the Caribbean Sea. Built on the slope of the Avila (8,635 feet), it is 3,025 feet above the tide-level, and from its elevation it has an enjoyable climate. There are numerous public parks and gardens and handsome promenades. The most notable buildings are the federal palaces, the president's Yellow House, the university, whose library of 30,000 volumes is open to the public; the exhibition palace, the cathedral and the splendid basilica of St. Ann. Besides the university, there are various colleges and technical schools. There are many newspapers. Carácas is the terminus of four railroads. Its chief export is coffee

through the port of La Guaira; also cocoa, caoutchouc, ornamental feathers and furniture woods. Population, 75,000.

**Caracci** (*kär-rät'chē*) or **Carracci,** a celebrated family of Italian painters, the founders of what is called the Bolognese school of painting, which flourished in the latter half of the 16th century. Ludovico Caracci, son of a butcher, was so poor a student that his masters advised him to give up painting. Instead of following their advice, he went to Parma and Venice, and there studied the works of the great masters, and came back filled with new ideas of his art quite different from the lifeless style of his native Bologna. With his two cousins, he started the eclectic school, which has become famous in the history of painting, and soon all other schools at Bologna were closed. Many of the works of this master are preserved at Bologna.

Annibale Caracci, a cousin of Ludovico, was, perhaps, the greatest artist of his family. He was born in 1560. He made rapid progress in the study of painting, and his fame soon reached Rome, where he was employed to paint the Farnese gallery, his greatest work. He died at Rome in 1609, and was buried close to Raphael's tomb in the Pantheon. The best Italian masters of the 17th century were of the school of the Caracci.

**Car'avans** are bands of merchants, pilgrims or other travelers who journey in company through the desert. The name caravan is of Persian origin; the deserts of Asia and Africa are its home. Here travelers seek safety in numbers, as well for defense against robbers as for the sake of aiding one another amid other perils of the way, the chief of which are storms of dust and whirlwinds. The hot and sand-laden wind, called in the Sahara Desert the simoom, has been known to destroy a whole caravan by suffocation. Not seldom does a line of half-buried bones of camels and of men greet the eye of the desert voyager. In the case of caravans from Tibet to China, yaks, mules and horses are used rather than camels.

Large and famous are the annual caravans which convey pilgrims to Mecca from Persia and from Cairo in Egypt. Several thousands of pilgrims will sometimes journey to Mecca in a single caravan. The internal long-distance trade of Asia and Africa is almost wholly a caravan trade. The chief overland trade-route between Russia and China runs close to the Siberian Railroad from Moscow to Irkutsk and thence to Kiakhta and Urga. A vast quantity of cotton goes by caravan from Khiva to Orenburg. Persia relies greatly upon caravans, since, except for its Russian trade, it is but ill-supplied with railroads. In the hot season it is usual for the desert caravans to travel by night; but they keep to as fixed a route as do ships at sea, as indeed the perils of their course are at least as great.

**Car'bohy'drates** (in plants), substances consisting of carbon and of hydrogen and oxygen in the proportion to form water, which are manufactured by green plants out of carbon dioxid and water in the presence of light. (See Photosynthesis.) Common illustrations of carbohydrates are sugar and starch.

**Car'bon** is one of the elements, and is the characteristic substance of plants and animals. It is found uncombined in the mineral, graphite or black lead, and in the pure, crystallized form in the diamond. Anthracite coal, charcoal, coke and lampblack are nearly pure forms of carbon. Soft coal and peat also contain much carbon. United with oxygen it is carbon dioxide or carbonic acid, a constituent of the atmosphere and of carbonates, of which calcium carbonate as limestone, marble, chalk and the earthy matter of corals and shells, as well as dolomite, are very abundant substances. With hydrogen, carbon forms marsh-gas and a great number of hydrocarbons, as those of petroleum and numerous coal-tar products. With hydrogen and oxygen it forms acetic acid and other organic acids, alcohol, oils, fats and the so-called carbohydrates, of which the sugars, starch and cellulose, important constituents of plants, are the best known. A great many very complicated carbon compounds occur in plants, and particularly in animals, in which (besides carbon, hydrogen and oxygen), nitrogen and sometimes sulphur and other elements are present. Carbon also unites with certain metals, and with iron it forms steel and cast-iron. Certain denser forms of carbon, such as retort-carbon from gas-works and petroleum-refining, conduct electricity well, and are extensively used in batteries and electric lamps. See Charcoal, Chemistry, Diamond and Electric Light.

H. L. Wells.

**Car'bondale,** a city of Pennsylvania, noted for the mines in its neighborhood, is on the Lackawanna River, 16 miles northeast of Scranton. It is the chief town of Lackawanna County, and its railroad facilities are furnished by the Delaware & Hudson; the New York, Ontario & Western; and the New York, Erie & Western railroad. The mines of the region are worked by the Delaware and Hudson Canal Company, and yield over a million tons annually. The city's industries have as their motive power abundant electrical and other facilities, derived chiefly from the great adjacent coal-fields. Population, 17,040.

**Carbon'ic Acid** or carbon dioxid, also called fixed air or choke-damp, is a gas which forms about $\frac{1}{2500}$ part of the air.

Enormous quantities of it are poured into the air by the breathing of animals and the burning of fuel, but plants absorb it by their leaves to get carbon for the formation of wood, and in this way the proportion is kept quite constant. Carbonic acid contains by weight 12 parts of carbon and 32 of oxygen. It is a dense gas, heavier than air, and can be poured from one vessel to another like a liquid. In vats in which it is being given off by fermentation, it remains at the bottom for some time, even when freely exposed to the air, so that fatal accidents have resulted from workmen carelessly entering them. Under a pressure of about 600 pounds to the square inch it becomes a liquid. When this liquid is allowed to escape through a small jet, it rapidly evaporates and causes intense cold, so that a certain portion becomes frozen into a solid resembling snow. This solid passes back into a gas without becoming a liquid. Carbonic acid can be easily dissolved in water. The sparkling appearance of soda and seltzer waters, etc. is produced by the carbonic acid which has been dissolved under pressure, and so passes out when exposed to the air. Champagne and fermented ginger beer contain carbonic acid by a natural process of fermentation. The pure gas, or air containing considerable quantities of it, causes suffocation when breathed, because the lungs do not get the necessary oxygen. It does not support burning. If a lighted taper is thrust into a vessel of it, it is immediately put out. Carbonic acid may be readily prepared from chips of marble and hydrochloric acid.

**Car-Building.** While the term car strictly means any wheeled vehicle, in America it has been applied only to railway cars, in the first instance, but has been extended recently to automobiles or motor-cars. Automobile building will receive separate treatment. The most distinctive feature of the car is the truck, which consists of a frame, one at each end of the car, with two, four, six or even eight wheels underneath, and on the top a swivel, on which the car-body rests, so that it can move freely on the trucks under all the varying conditions of the road. The wheels are of many kinds, agreeing, however, in rejecting the spoke and axle arrangement which most wheels have. Moreover, the wheels do not turn on the axle, but are fixed firmly upon it, by shrinking or other means, and the axle turns in the axle box. The wheels have flanges to keep them on the rails. The car rests on two sets of springs, one vertical, which supports a frame, from which the other, an elliptical spring, is suspended. The car rests immediately on the latter. The car-body is of many types. The finest is the Pullman car. This was first built about 1867 by George Mortimer Pullman; they are for the most part built at the Pullman works near Chicago. The latest modifications are cars in which the berths are put under the floor, when not in use, and the car itself turned into a parlor-car. The pressed-steel car is built at Pittsburg; in it every part of the car is built of steel. Pullman cars commonly have a steel framework which embraces the platform, so as to form what is called a solid vestibule-train. Their strength has saved many lives in our numerous accidents. American cars differ from those of other countries in their greater size and in having the aisle run up the middle of the car. Among freight-cars the most noteworthy are the refrigerator-cars, which are largely built and owned by private companies, such as the Armour Company and the Swift Refrigerator Company of Chicago. Special cars are used to carry enormous loads of coal from the mountains of Pennsylvania to the coast cities. The Standard Oil has built special tank-cars for its oil. Most of the regular freight and passenger-cars are now built at the shops of the several railroad companies. There are special features, such as automatic couplers, now compulsory on all cars, air-brakes, gas-lighting and heating from the steam of the engine. In most countries of Europe they still employ foot-warmers which can be filled with hot water at certain stations.

**Cardenas** (*kär'dā-nàs*), **Cuba,** a seaport in the province of Matanzas, situated on the north side of the island, 78 miles east of Havana, with which it is connected by rail, as well as with Santa Clara, Cienfuegos and Matanzas. It is the chief port for the export of sugar, and has besides a considerable local commercial trade. It is an attractive city, with many fine plazas and public buildings. In our war with Spain, Cardenas Bay was the scene of a sharp engagement between our blockading vessels and the Spanish batteries, in which the first American officer to lose his life in the war (Ensign Worth Bagley) was killed. Population, 28,576.

**Car'diff,** a seaport town in southern Wales, on Bristol Channel. It is noted for its magnificent docks, from which several millions of tons of iron and coal are exported yearly. Cardiff is well known in history. The Arthurian legend of the sparrow-hawk refers to Cardiff. King Henry I imprisoned, for 26 years, until his death, his brother, Duke Robert, in the old castle, which still stands. The castle was once of enormous strength, and is now the mansion of the Bute family, to whom the present prosperity of Cardiff is largely due. At Cardiff there is a branch of the University of Wales, with a teaching staff of 55 and with 661 students. Population, 182,280.

**Cardinal-Bird,** one of the finest song-birds of America, whose habitat is the southern states, with kindred species frequenting Mexico, Central America and Lower California. It is sometimes called the Virginian nightingale, the bird having a clear, whistling and melodious song. Its beautiful plumage and attractive song make it a favorite cage-bird, while it is usually hardy, even in confinement. The male bird is of a bright red color, marked with black, and is adorned with a high crest; he is devoted to his mate when breeding; the eggs, usually not over four in number, are in color a speckled white or blue, spotted with brown.

CARDINAL-BIRD

**Ca'rey, Henry Charles,** American political economist, was born at Philadelphia in 1793 and died there on October 13, 1879. In early years he was associated with his father as a bookseller and publisher, and for a time was at the head of the firm of Carey & Lea. In 1835 he became a close student of political economy, in the ranks of those opposed to the rent-doctrine of Ricardo and the theory of population of Malthus. His chief writings embrace *The Principles of Political Economy; The Credit System in France, Britain and the United States; Principles of Social Science; The Unity of Law,* etc. He was a protectionist, and opposed to international copyright.

**Ca'rey, William** (born 1761, died 1834), a Baptist missionary and Oriental scholar, was born in Northamptonshire, England. In 1793 he was sent out as a Baptist missionary to India. He established a printing-press at Serampore, and published dictionaries and grammars of several eastern languages. From his press there issued 200,000 Bibles, in about 40 different languages or dialects. He was made professor of Oriental languages in the college at Fort William, Calcutta. The Protestant mission-movement of the 19th century regards him as its father.

**Cargados** or St. Brandon Islands are dependencies of Mauritius, and for the most part mere sand-banks.

**Caribbean Sea** (*kăr'ĭb-bē'an*), that part of the Atlantic Ocean lying between Cuba, Santo Domingo and Porto Rico on the north, Venezuela and Colombia on the south, the Lesser Antilles on the east and Central America on the west. It communicates with the Gulf of Mexico through a channel, 120 miles wide, between Cuba and Yucatan. Its navigation is for the most part clear and open. It contains some large gulfs.

**Cariboo and Cassiar** are two important districts in British Columbia on the north. Placer miners won $50,000,000 of gold from the creeks and benches of these districts years ago. Wealthy companies are now engaged in hydraulic mining on a large scale. Large deposits of gold and silver quartz have been found on Portland Canal. Coal and copper ore are plentiful. These districts are proving to be rich and attractive.

**Caribou.** See DEER.

**Carl'eton, Gen. Sir Guy, Lord Dorchester.** This distinguished soldier and statesman was born at Strabane, Ireland, Sept. 3, 1724. He was at the siege of Louisbourg as lieutenant-colonel; wounded, as colonel, at the storming of Quebec; at the siege of Belle Isle and the taking of Havana by the British and American forces in 1762. On Sept. 24, 1766, he was appointed lieutenant-governor of Quebec, succeeding to the governorship on Jan. 10, 1775, when he took command of the British forces in the Canadas, defending Quebec successfully against Montgomery and Arnold during the siege. He captured Crown Point in October, 1776; was commissioned lieutenant-general August, 1777; and took supreme command of the British forces in America Feb. 23, 1782, succeeding Sir Henry Clinton. He arrived in New York on May 5, and was in command at the evacuation on Nov. 25, 1783. He was reappointed governor of Quebec on April 11, 1786, created Lord Dorchester the August following, resigned the post in 1796, and died near Maidenhead Nov. 10, 1808.

**Carleton, Will,** American author and lecturer, was born at Hudson, Mich., in Oct., 1845, and graduated at Hillsdale College in 1869. Shortly after graduating, he took to journalism and to the writing of ballads of farm and domestic life, which have won him wide popularity. His published verses include *Farm Ballads, Farm Legends, Farm Festivals, City Ballads, Legends and Festivals* (3 vols.), *Rhymes of Our Planet* and *Young Folks' Centennial Rhymes.*

JOHN G. CARLISLE

**Carlisle** (*kär-līl'*), **John Griffin,** an American politician, was born in Kentucky in 1835. After

serving in the legislature and as lieutenant-governor of that state, he was elected to Congress for seven successive terms, and was speaker of the house for three terms. In 1889 he was returned to the United States senate, resigning to become secretary of the treasury under President Cleveland in 1893. He is a forceful debater and one of the most prominent leaders of the Democratic party.

**Carlisle', Pa.,** a borough, the county seat of Cumberland County, on the Cumberland Valley and the Philadelphia & Reading railroad, 17 miles west-southwest of Harrisburg. In the vicinity is Mount Holly, where there are mineral springs of high medicinal value. The borough is the seat of the United States Indian Training and Industrial School, of Dickinson (M. E.) College and of the Metzger Institute for girls. Its industries embrace flour-mills, shoe and carpet-factories, paper-box factories, machine-shops and chain and frog-switch works. Carlisle was founded about the middle of the 18th century, and here, during the Whiskey Rebellion the Pennsylvania and the New Jersey troops were mustered; while during the Civil War the place was shelled by the Confederates. Population, 10,726.

**Carlisle Institute,** a training school for the higher education of the Indian youth at Carlisle, Pennsylvania, arose out of the undertaking of Captain R. H. Pratt in 1875 to educate 74 Indian prisoners who had been set under his charge at St. Augustine, Florida. At first the education offered was chiefly of an industrial kind. But in 1879 the school was removed to Carlisle, and literary subjects were introduced into the course of instruction. Various trades are still taught to the Indians at Carlisle, as at Hampton Institute and the Indian schools of the west. Carlisle Institute stands for an effort on the part of the government, which makes an annual grant for its support, to solve the problem of the future of the Indians in a permanent way. This is not to be done by force of arms, but only by education. It is the custom at Carlisle Institute to allow outings to Indian boys and girls, that they may live for a few months with the family of a farmer, earning a small wage, and so learn to understand the customs of their white neighbors. See Boone: *Education in the United States.*

**Carlists,** the name by which are known the supporters of the Spanish pretender Don Carlos, brother of Ferdinand VII, and of later claimants of that branch of the Bourbon family. The name is also applied to the partisans of Charles X of France (1824-30) and his descendants.

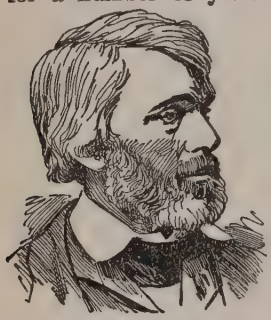
**Car'los I,** King of Portugal from 1889 to 1908, was born on Sept. 28th, 1863, and died by the hand of an assassin on Feb. 1st, 1908. Through his father he was a descendant of John of Braganza, sometimes called John the Restorer, who was proclaimed king in 1640 when Portugal regained independence from Spain. His mother is the daughter of Victor Emmanuel, the first king of modern Italy, and so the Portuguese monarch was a cousin of Italy's present king. He married a daughter of the Orleans claimant to the throne of France, and himself became king on Oct. 18th, 1889. His reign was marked by serious colonial, financial, political and social troubles. Difficulties with England broke out in regard to Anglo-Portuguese boundaries between the adjoining African possessions of the respective powers. In 1891 the national finances became deranged, interest on the debt was scaled, and in 1907 a monopoly in tobacco was created. The so-called political parties had for decades mismanaged the country and robbed its treasury. In 1906-7 the king endeavored to end all financial and governmental difficulties at a single stroke by making the premier practically a dictator, suspending the constitution and inaugurating drastic fiscal reforms. Revolutionary resistance ensued, and resulted in the assassination of the king and the heir-apparent, who were fired upon by a group of conspirators on a street in Lisbon as the king and his family were returning to the palace in a carriage. Personally, Carlos was popular, though his injudicious and not always justifiable methods of removing abuses had recently provoked discontent. Among scientists he was an authority on deep-sea soundings.

**Carlovingians** (*kär'lō-vĭn'jĭ-anz*), the name of a dynasty, which, during the 8th, 9th and 10th centuries gave sovereigns to Germany, France and Italy. Their origin dates from the beginning of the 7th century, to Arnulf and Pepin of Landen, two Frankish lords; but the name is derived from Charles Martel. His son, Pepin the Short, was the first to take the title of king. Pepin's son, Charlemagne, by virtue of his wide conquests, styled himself emperor, and in the year 800 was crowned by the pope as emperor of the western world. When his empire broke up in 887 into nine separate kingdoms, the most important ones, Germany, France and Italy continued for some years under the sway of the family. They ruled in France till Hugh Capet founded the dynasty called the Capetian; in Germany till the rise of the houses of Franconia and Saxony; and in Italy until Otho the Great united that country to the German empire.

**Carlsbad** (*kärls'bät*), a town of Bohemia, 70 miles from Prague. Lying in a beautiful narrow valley, between steep granite mountains, it is noted as the most aristocratic watering-place in Europe. Its min-

eral springs are said to have been discovered in 1370 by Emperor Charles IV, to whom a statue has been raised in the market place. It is crowded with visitors from June to August, the number averaging from 25,000 to 30,000. Population, 12,579.

**Carlyle** (*kär-līl'*), **Thomas,** a great British historian and essayist, was born at Ecclefechan, Scotland, Dec. 4, 1795. He was educated at Edinburgh University, and for a number of years supported himself by teaching. At the same time he was engaged in literary work and study. He wrote articles for the *Edinburgh Encyclopædia*, the *Edinburgh Review* and various other magazines, making, besides, many translations from the German. *Sartor Resartus* is perhaps Carlyle's most characteristic work. Its fantastic hero, Diogenes Teufelsdröckh, illustrates in his life and opinions what Carlyle calls the Philosophy of Clothes. But the work which established his reputation as a genius of the highest order, and proved him to be, as Goethe said, "a new moral force in the world" was his *French Revolution*. Perhaps the most successful of his works is *Cromwell's Letters and Speeches*, which entirely changed the current opinion regarding that character. The *History of Frederick the Great* is Carlyle's most ambitious work. During a number of years Carlyle lectured on *German Literature*, the *Successive Periods of European Culture*, the *Revolutions of Modern Europe* and *Heroes and Hero-Worship*. He died at the age of 86, Feb. 4, 1881, at his home in Chelsea, London, where he had lived for 40 years. Many honors were offered to Carlyle, most of which he refused; but he accepted the appointment of lord-rector of Edinburgh University. His installation address, *On the Choice of Books*, is a thought-stimulating and instructive work. He was a friend of many of the great men of his day, such as Coleridge, Goethe, John Stuart Mill and Emerson. Carlyle probably exerted a greater influence on British literature during the middle of the 19th century than any man of his time. Although his literary style is peculiar, rough and jerky, yet it is always powerful and often grand. See his life by Froude, his early letters edited by C. E. Norton and the correspondence between Goethe and Carlyle. Carlyle's wife was one of the most accomplished women of her time.



THOMAS CARLYLE

**Car'man, Reverend Albert,** was born in eastern Ontario in 1833 He is a graduate of Victoria University (Cobourg), and taught for some years. In 1874 he was elected a bishop of the Methodist Church in Canada. After the union of the Methodist bodies in 1833 he became general superintendent of the Methodist Church in Canada, and represented the Methodist Church at the Ecumenical Methodist Conference held at Washington in 1891. As preacher, organizer, teacher and controversialist he has but few equals.

**Carman [William] Bliss,** one of the leading poets of English-speaking America, was born in Fredericton, N. B., April 15, 1861. He graduated from the University of New Brunswick in 1881, and studied later at Harvard University and the University of Edinburgh. After experimenting with law, engineering and teaching he became an editor of the New York *Independent* in 1890, and has since devoted himself to writing. His poetic writings are voluminous, and include, in addition to the three volumes of *Songs from Vagabondia*, written in collaboration with the late Richard Hovey, *Low Tide on Grand Pré*, *A Sea-Mark*, *Behind the Arras*, *At Michaelmas*, *Ballads of Lost Haven*, *By the Aurelian Wall*, *St. Kavin*, *The Green Book of the Bards*, *The Book of Myths*, *Ode on the Coronation of King Edward*, *A Winter Holiday*, *Songs of the Sea-Children*, *Songs from a Northern Garden*. He is a cousin of Charles G. D. Roberts. Of late Mr. Carman has been writing essays on literary and other topics, several volumes of which have appeared in book form. In him speaks the voice of the Canadian forests and sea coasts, and more than one of his poems gives promise of immortality.

**Carmel** (*kär'mĕl*), meaning woodland or garden land, is the name of a range of hills in the northwest of Palestine, ending at the sea in the promontory of Mt. Carmel. The average height is 1,500 feet above the sea, and the highest elevation is 1,750 feet. Carmel was the scene of some of the great events of Bible history. It was the retreat of the prophets Elijah and Elisha. The brook Kishon flows at its base. A convent is now situated on the mountain, where travelers are entertained. A German colony has settled near the foot of the mount and on its sides.

**Carmichael, The Right Reverend James,** Bishop of Montreal, born in Dublin, came to Canada, and was ordained in 1859. He became assistant minister of St. George's, Montreal, in 1868, and remained there ten years. He was rector of the Church of the Ascension in Hamilton for some years, but returned to St. George's, Montreal, as rector in 1882, and was appointed Dean of Montreal in 1883. He is president of the Natural History Society of Montreal. He has published several volumes, and is one of the ablest preachers and lecturers in

Canada, held in highest esteem by all the churches.

**Carna'tion,** a beautiful and fragrant double-flowering variety of the clove-pink. It is a universal favorite of florists, and exists only in a state of cultivation. The flower is often three inches in diameter, and the prevailing colors are white, scarlet and pink. The carnation prefers a rich soil and should have plenty of fresh air.

**Carnegie** (*kär-nā'-gĭ*), **Andrew,** the Scoto-American steel-manufacturer and philanthropist, was born at Dunfermline, Scotland, Nov. 25, 1835. His father was a weaver, who, with his family, emigrated in 1848 to the United States. Beginning life with only a limited school education, young Carnegie worked at first in various humble positions in Pittsburg, Pa., where he at length found employment in a telegraph office and obtained a footing in the railroad world. The basis of the immense fortune he was afterward to amass was due to his connection with iron-works, which he established at Pittsburg, and which subsequently developed into the vast industry of the Carnegie Steel Company, located at Homestead and elsewhere in and about Pittsburg. The Carnegie Company, in February, 1901, was, with a number of other manufacturing concerns, incorporated as the U. S. Steel Corporation (q. v.), having a total capitalization of one billion one hundred million dollars. In achieving success, he was at a critical period in life aided by making the acquaintance of Mr. Woodruff, inventor of the railway sleeping-car, and by being one of a fortunate oil-syndicate. The story of Mr. Carnegie's career and the vast wealth he has amassed reads like a romance; and, to his honor be it said, he has made noble use of his princely fortunes. For 30 years he has been devoting large sums of money to benevolent objects and especially to the founding and endowing of public libraries, notably $500,000 for a library in Pittsburg and $250,000 for a library in Edinburgh, Scotland, and $5,200,000 to erect and equip 80 public libraries in New York City. It is calculated that Mr. Carnegie has spent in all more than 60 million dollars on over 2,000 libraries, which he has been instrumental in founding or aiding. Besides, he has donated ten millions towards the founding at Pittsburg of the Carnegie Institute and fifteen millions for creating the Carnegie Foundation, a trust fund to provide annuities for college professors in the United States, Canada and Newfoundland, who from old age or other physical disability have retired from active service.

ANDREW CARNEGIE

He signalized his retirement from active business in 1901 by gifts of $5,000,000 for the benefit of his old employes. He donated to five Scotish universities the sum of ten million dollars, and twenty-five million dollars to found a university at Washington, D. C., which is to be under the supervision of the national government. He has also donated over ten million dollars for those dependent on persons losing their lives in saving life or for the heroes themselves if they are only injured. Mr. Carnegie is the author of the following publications: *Round the World, Triumphant Democracy, The Gospel of Wealth,* a *Life of James Watt, The Empire of Business, An American Four-in-Hand in Britain,* and *Problems of Today,* together with many articles contributed to the magazines and reviews of the day. Mr. Carnegie has contributed largely to the endowing, both in this country and in Great Britain, of educational institutions and the equiping of hospitals. He also provided funds for the permanent building at The Hague (q. v.) for the international court of arbitration.

**Carnegie Institution,** founded and endowed by Andrew Carnegie at Washington, D. C., in 1902, to encourage research, assist investigation and give aid in the promotion of discovery in the arts and sciences, as well as to help in laboratory work and assist meritorious persons and institutions in all departments of investigation and research, besides promoting the publication and dissemination of the results of the same. The institution, which has been endowed by its founder with gifts aggregating $25,000,000, is managed by a board of 24 trustees, who meet annually, and by an executive committee acting in concert with the president. Its further design is to increase the facilities of higher education, giving aid to universities, learned bodies, scientists and experts in all important fields of research, investigation and meritorious practical work, and to provide buildings, libraries, laboratories and apparatus.

**Carnegie Libraries.** In 1891 Andrew Carnegie wrote in *The North American Review* as follows: "The result of my own study of the question: What is the best gift that can be given a community? is that a free library occupies the first place, provided that the community will accept and provide for it as a public institution, as much a part of the city property as the public schools, and indeed an adjunct to those. Closely allied to the library and, when possible, attached to it, there should be rooms for an art-gallery and museum and a hall for such lectures and instruction as are provided in the Cooper Union (New York City.)" This conclusion is largely the fruit of Carnegie's own experience; for as a poor boy he benefited largely by some books that a kind friend lent him. His

policy since the above was written has not changed. A standing offer of a free library is open to any town in the United State or Great Britain, provided that the town will guarantee a certain annual sum, usually 10 per cent. of the amount donated, in support of the library. New York City alone has received over $5,000,000 for such libraries. In Pittsburg the library is rather overshadowed by the allied institutions for instruction, which make up the Carnegie Institute. About $10,000,000 is the amount of Carnegie's contribution to this. St. Louis has received $1,000,000, Detroit $750,000. But it is impossible to mention all the libraries that have been established by Carnegie in this country and Great Britain. His estimate of the value of libraries, quoted above, is emphasized by the fact that so large a proportion of his gifts have gone to helping them.

A significant remark of Mr. Carnegie, in this connection, is that when he was a boy he was so busy reading the books that interested him that he had no time for the wasteful and injurious habits acquired by idle boys.

**Car'nival,** a festival which originally began on the day after the feast of Epiphany and lasted till midnight on Shrove Tuesday; that is, from January 6 till Lent. In later times it was limited to from three to eight days before Ash Wednesday. The forms and customs of the carnival come from the old heathen festivals of the springtime. Banquets of rich meats and drinking bouts were its chief attractions during the midd e ages. The chief days had distinct names, as fat or greasy Sunday, blue Monday, etc. In Germany the carnival is celebrated in the cities of the Rhine provinces and is also being revived in the north. The celebration is usually confined to the wearing of masks, to processions in costume and masked balls. In the south of France and throughout Italy, especially in the cities, it is still a popular festival. Venice used to be noted for the splendor of its carnivals; that of Rome was long the most noted yearly revel in the southern cities of Europe. Here races of riderless horses along the crowded Corso, the throwing of flowers and plaster confections from the windows and balconies on the people in the carriages and cars in the streets and a return fire from below were among the chief features and frolics of the celebration. In recent years the Roman carnival has practically ceased.

**Carniv'orous Plants,** certain seed-plants which have developed the habit of capturing insects and using them for food. They live usually in swampy regions, and are able to capture insects in various ways, and then digest them and absorb the nutritious substances. The commoner forms are as follows: The pitcher plants, belonging to the genus *Sarracenia*, are common in swampy ground both north and south. The leaves are shaped like slender hollow cones and rise in tufts from the ground, the cone containing water, and its mouth being more or less overarched by a hood. A sweetish substance is secreted about the rim, and attracts the insects, which fall into the cone and are drowned. Such pitchers are often found more or less filled with the decaying remains of captured insects. In California a huge pitcher plant, *Darlingtonia* by name, has leaves sometimes three feet high. The best known tropical forms belong to the genus *Nepenthes* and its allies, in which the urns swing from the tendrils developed at the ends of the leaves. Various forms of *Nepenthes* are common in greenhouses. Another group of carnivorous plants is the group of sundews, belonging to the genus *Drosera*. They also grow in swampy ground and have rosettes of basal leaves, which are beset by sensitive glandular hairs. Small insects coming in contact with a sticky gland are held fast, and the leaf closes over the struggling victim and digests it. Perhaps the most remarkable carnivorous plant is *Dionæa* or Venus' fly-trap, which is found only in sandy savannas near Wilmington, N. C. The leaf blade is constructed like a steel trap, and the two halves snap together whenever any of the bristles are touched by an insect. In this way the insect is caught and gradually digested.

JOHN M. COULTER.

**Carnot** (*kär'nō'*), **Marie François Sadi,** a French statesman, was born at Limoges, in 1837. Entering politics, he became a leader of the strict republicans. He was elected a member of the national assembly and later of the chamber of deputies, and was minister of public works and finance. In 1887 he became president of France. He was assassinated at Lyons, June 24, 1894.

M. FRANCOIS SADI CARNOT

**Carnot** (*kär'nō'*), **Nicolas Leonard Sadi,** a distinguished French engineer and physicist, born at Paris, June 1, 1796; died Aug. 24, 1832. In his memoir on the *Motive Power of Heat* he investigated the problem of using heat to do work in an engine, and he first showed under what conditions the heat may be most economically used. This result, which is embodied in a law known as *Carnot's Theorem*, is one of the foundation-stones of the science of

thermodynamics. (See Magie's translation of Carnot's paper in Harper's *Scientific Memoirs*).

**Carob** (*kăr'ŏb*) or locust tree, a native of the Mediterranean countries. In size and manner of growth it is somewhat like the apple tree, but has dark, evergreen leaves. The fruit is a brown, leathery pod, four to eight inches long, containing fleshy and, at the last, spongy and mealy pulp of an agreeable, sweet taste, in which lie a number of brown seeds, like flattened beans. The sweet pulp makes the pods an important article of food to the poorer classes. They are also used as food for horses and cattle. They are sometimes called St. John's bread, in allusion to the tradition that they are the locusts which formed the food of John the Baptist in the wilderness. They are also thought to be the husks in the parable of the Prodigal Son. Some carob trees yield 800 or 900 pounds of pods. A preserve and a kind of sugar are sometimes made from the pulp. The carob is not the same as the American locust.

**Carol I, King of Rumania,** was born in Germany, April 20, 1839, the son of Prince Carl of Hohenzollern. In 1866, he was chosen prince of Rumania, then a dependency of Turkey. In 1881 he declared Rumania independent and became king. His nephew Ferdinand succeeded him on his death October 10, 1914.

**Car'oline Islands,** a group of about 500 coral islets, which form part of the German New Guinea protectorate, in the western Pacific, lying between the Marshall and Pelew Islands, with an area of 270 square miles. The Pelew group, sometimes included in the Caroline Archipelego, covers 560 square miles. Three quarters both of the area and the population are to be found in five volcanic islands, which are all fertile and well watered. The people belong to the brown Polynesian stock, are strongly built, and are amiable, gentle and intelligent. They are bold sailors and carry on a thriving trade with the Ladrones to the north, where they have several settlements. Copra, the dried kernel of the cocoanut, is largely exported. The islands were discovered in 1527 by the Portuguese, and in 1866 were annexed to Spain. In 1885 a dispute arose over the islands between Spain and Germany, which was referred to the pope for decision. He decided in favor of Spain, but gave Germany special trade privileges. In 1899 Germany secured the group by purchase from Spain. For administrative purposes the islands are divided into three groups: the Eastern Carolines, with Ponape as the seat of government; the Western Carolines and the Pelew Islands, with Yap as administrative center; and the Marianne or Ladrone Islands, of which Saipan will be the future seat of government. The population is mainly of Malay origin, with some Japs and Chinese and about 900 whites. The northern group of the islands, being volcanic, is for the most part uninhabited. In 1898 one of this group of islands, Guam, was ceded to the United States.

**Caroline of Brunswick** (1768–1821), queen of George IV of England, whom she married in 1795, as Prince of Wales and before that monarch came to the throne. In 1796 she gave birth to the Princess Charlotte, and after this event the prince separated from her; and when in 1820 he became king, he refused to permit her to share the throne as his queen. To induce her to yield, she was offered 50,000 pounds sterling a year if she would leave England; but this she indignantly refused. As the English generally took her side and thought her an ill-treated wife, the government was ill-advised enough to institute proceedings against her for unchastity. This gave Lord Brougham, while yet at the bar, the opportunity of making an eloquent defense of her cause, which forced the governmen to abandon its divorce bill which it had lobbied through the house of lords. She died a fortnight after she had been refused admittance at Westminster, on the coronation day of her husband.

**Carp,** a common widely distributed food-fish. The carp family is the largest family of fishes, and embraces, as relatives of the carp proper, the chub, dace, shiners, goldfish, etc. The carp is a hardy, sluggish fish,

CARP

often bred in artificial ponds. It eats water-insects and other small aquatic animals and also leaves of water-plants. It is preyed upon by kingfishers, turtles and crayfishes; while a number of fish feed upon its eggs and young.

**Carpaccio, Vittore** (*vē-tō'rā kär-pä'chō*), an Italian artist, was born about 1450 and died in 1525. All that is known of him is that Istria was his birthplace and Venice his home. He belonged to its old school of painters, being one of the most celebrated masters and a rival of Bellini, and put Venice into the backgrounds of his pictures. He excelled as an architectural and landscape painte , but preferred to paint sacred subjects dramatically. His histories of Saints Stephen and Ursula are his most celebrated paintings. He was vivid in imagination, natural in expression and correct in arrange-

ment, and employed a great variety of figures and costumes. Benedetto, his son, lived about 1550, and painted a fine *Coronation of the Virgin*.

**Carpathian** (*kär-pā'thĭ-an*) **Mountains,** the second great range of central Europe, extend in a great semicircle over a space of 880 miles from Presburg on the Danube to Orsova on the same river. They lie almost entirely within the Austrian dominions, forming two great masses: one in Hungary, which abounds in minerals; and one in Transylvania, whose highest peak, Negoi, is 8,343 feet high. Between the peaks are lower ranges of wooded mountains. Forests, steep precipices, narrow ravines and extinct craters combine to make the Carpathians a magnificent spectacle. The mines of Schemnitz in the Hungarian range are celebrated.

**Car'pel.** The innermost structure of the flower, which contains the ovules. A flower may have one or more carpels which remain separate from one another or unite to form a single pistil. See FLOWER.

**Car'penter, William Benjamin** (born 1813, died 1885), an English medical man and great writer on physiology, was born in Exeter, and after studying medicine devoted himself to scientific study and investigation. He was appointed at different times lecturer and professor at various institutions, and edited a medical review and a *Popular Cyclopædia of Science*. He made three voyages to the North Atlantic and Mediterranean to make explorations in the deep sea, in the study of biology. In 1882 he lectured in the United States. His work and writings have done much for science. Among his publications may be mentioned *Zoology and the Instincts of Animals*, *The Microscope and its Revelations*, a work on *Comparative Physiology* and *The Principles of Mental Physiology*.

**Carpet,** a covering for floors, usually manufactured principally, of wool. Carpets of some sort date back to very early times. They were in use in ancient Greece and Italy and probably in Egypt. Among the most famous carpets are those of Persia. Even among the higher classes there, carpets form nearly all the furniture of a room, and a Persian not only sits and sleeps upon a carpet, but makes a table of one. Fine Persian carpets are highly prized for their beautiful designs and the quiet harmony of their colors. Small pieces of old Persian carpets recently sold in Paris for over $5,000 apiece. Indian carpets and Turkey carpets are well known varieties. A few Turkish and imitation Persian carpets are made in Adrianople. The Scotch carpet is the oldest kind of machine-made carpet. The Brussels is a famous European make. In this carpet the worsted threads are interwoven into a network of linen. It is woven on a loom with an apparatus which, at each throw of the shuttle, raises such of the colored yarns to the surface as the pattern requires. Velvet, tapestry and jute carpets are also much used. Great Britain is the great center of the world's carpet-making, including the well known Brussels, Wilton, Kidderminster and Axminster varities. In the United States carpet-manufacture has also become an important industry, and many of the most valuable improvements are the result of American inventive genius. There are in the United States about 400 carpet-factories, which annually produce about 75,000,000 yards of carpeting, valued at over $60,000,000. Philadelphia is the most important seat of the industry in the United States. Associated with the trade in carpets and pile-fabrics is that in rugs and tapestry. The latter was early known to the Greeks, and had been carried to a high state of perfection at Athens, but it is usually associated with the Flemish weavers of Arras during the 15th and 16th centuries. It was introduced into England by Wm. Sheldon, in Henry VIII's reign, and into Paris by Henri IV about 1606, the Gobelin tapestry being due to Louis XIV. The Bayeux tapestry is simply a roll of linen-cloth worked with colored thread.

**Carpet-Baggers.** After the Civil War the southern states fell largely into the hands of the negroes, who had just received the right to vote. To take advantage of their ignorance many politicians of low principles came down from the north, and became citizens of such states and then leaders of the negro voters. They were called carpet-baggers because many of them had no property interest in the southern states, and came down with nothing but what they could carry in a carpet-bag. These men, having got into office and power, proceeded to rob the southern states and to humiliate the southern whites. In many cases they laid a burden of debt and of unwise legislation upon those states.

**Carpet-Beetle,** a small beetle, the larva of which is very destructive to carpets, woolen clothing, furs and feathers. It has attracted wide attention in recent years on account of its injury, especially to carpets. The larva is about one fifth of an inch long, and covered with dark brown hairs. It is frequently called buffalo-moth. The perfect insect is a small black, white and red beetle, about one seventh of an inch long, feeding on the pollen of flowers—often on currant bushes. They enter houses in the spring to lay their eggs. The best way to avoid this pest is to use rugs instead of carpets and trap the larvæ by woolen cloths on the floors of closets.

**Carpet-Sweeper,** a familiar and useful device in the economics of the household for brushing carpets and rugs with ease, efficiency and the absence of dust. It consists of a revolving brush enclosed in a wooden and metal box, and is put in mechanical operation by pushing the attached long handle back and forth on the carpet, the revolving

brush gathering up the dust and confining it, until emptied, in the receptacle which forms part of the machine.

**Car'pogo'nium** (in plants), the peculiar female organ of the red algæ. See RHODOPHYCEÆ.

**Carrara** (*kär-rä'rä*), a town of Italy, about sixty miles northwest of Florence, lies in a deep valley of the Apennines near the sea. It is famous for its marble quarries, which have been worked since the days of the Romans. Its port is Avenza, at a distance of some three miles. The value of the marble of Carrara lies not only in its beauty but in its durability and smoothness when polished. No stone is so much in demand for the art of the sculptor. Each year sees an output of over 100,000 tons of Carrara marble; and, if we include those who saw and polish the stone for export, the quarries afford employment to about six thousand men.

**Car'riage,** a general name for any vehicle used to carry passengers, either on roads or railroads. It is mounted on two or more wheels and varies in form and build. The earliest carriages were made for war, but as far back as the time of Joseph carriages were used also for royal pageants. Among the Greeks chariot-races formed an important part of the Olympic games; the Romans had two, three and even four-horse chariots; and the Scythians are said to have had a covered chariot, the top of which could be removed and used as a tent. The earliest record of the carriage of modern times belongs to about the year 1280, when Charles of Anjou entered Naples with his queen, riding in a caretta, a small decorated car. But it was considered an effeminate habit to use carriages, and Queen Elizabeth reigned seven years before she had a coach. The boatmen and the owners and bearers of sedan chairs bitterly opposed them. The early carriages were heavy. lumbering affairs, without springs. Early in the 18th century leather straps were used to suspend the body of the coach, and in 1804 the oval springs, now so common, were invented by an Englishman. Since then the improvements in carriages have been numerous. There are many sorts of carriages; of two-wheeled vehicles are the gig, dog-cart, hansom-cab, etc.; of four-wheeled open carriages are the phaeton, wagonette, etc.; the coach and omnibus are examples of closed carriages. The barouche can be opened or closed at will. Most European forms are used and have been improved in the United States, but there also are several distinctly American vehicles: the rockaway, the sulky, the buckboard and the light American buggy. In Japan and other eastern countries, the jinrikisha is used, which is a two-wheeled light cart pulled by a man. For railroad-cars see RAILROAD.

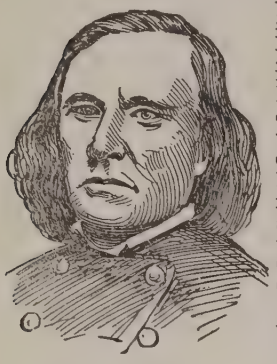
**Carrier, Common,** in law and commerce a company or individual trader who engage for hire to carry merchandize, freight or miscellaneous articles, and transport and deliver such to a given address or designated town or place. In law, he is bound to use reasonable expedition and care in the delivery of what is entrusted to him, and, so far as he can, to protect such from damage or mishap by the way, as well as from the result of negligence, and this whether it be by land or by water. Unless specially stipulated and agreed to, the carrier is not bound to carry articles of a dangerous character, involving risks in their cartage and transportation; nor is he usually held liable for perishable goods save where undue delay has occurred in transmitting them. In the case of railroad and steamboat companies transporting passengers from place to place, the law requires of them that they shall use all care and reasonable expedition in conducting the traffic. The liability of passenger carriers for baggage committed to their charge is also deemed the same as that of common carriers and forwarders of general merchandise.

**Carrier-Pigeon,** one of the more notable of the extensive varieties of pigeons or doves of the domestic breed, trained to convey letters or despatches from distant places, and often from a vessel far at sea, to its home. These bird-messengers to-day in use are known as homing-pigeons, many of them being made to accompany armies in the field (as in the Franco-Prussian War), whence they are despatched with messages to their homes, sometimes as far distant as 200, 300 and even 500 miles off. Their use in this respect is an old one, dating back even to the era of the first crusade (1100), when pigeon-posts were utilized by the Saracens for the transmission of information as to where they were and how it fared with them in engagements with the enemy. The carrier-pigeon is a bird of about 15 inches in length, markedly carunculated about the beak and eyes, and with wings extending almost to the tip of the tail. Their intelligence is great, and their flight is straight and rapid, though, as a rule, not exceeding 30 or 40 miles an hour, In long flights they are liable to attacks from enemies; while thick, foggy weather is a distinct disadvantage to them.

**Car'roll, Charles, of Carrollton,** (1737-1832), American patriot, one of the 56 signers of the Declaration of Independence, was born at Annapolis, Md., of Irish descent, and educated in Europe, chiefly in the Jesuit colleges in France. An inheritor of large wealth and heir to old manorial estates in Maryland, the youth returned to this country and soon espoused the cause of the colonies against the British crown and stoutly opposed arbitrary taxation. When the Revolutionary War came, it found him a member of the Continental Congress, and with others, including Benjamin Franklin, he was despatched to Canada to endeavor to get that colony to break with the mother

country and join those to the south of the line in seeking independence. Failing in his mission, he became a member of the Maryland constitutional convention and later one of its senate. From 1789 to 1791 he was a member of the federal senate and also served on the Maryland and Virginia boundary commission. In 1828 he laid the cornerstone of the Baltimore and Ohio Railway, and four years later died at Baltimore in his 95th year. His life and journals have been published.

**Carson, Christopher,** popularly known as Kit Carson, a famous American trapper and guide, was born in Kentucky in 1809. While yet a youth his family moved to Missouri, and he early engaged in trapping. He spent eight years as hunter to Bent's fort, and then acted as guide in the explorations of General Frémont. One of his most difficult feats was the driving of 6,500 sheep to California. He became Indian agent in New Mexico, and helped to bring about many treaties with the Indians. During the Civil War he did good service, and at its close was breveted brigadier-general. He died at Fort Lynn, Col., in 1868.



KIT CARSON

**Carson City, Nev.,** the seat of Ormsby County and the capital of the state, is on the Virginia & Truckee Railway, 12 miles east of Lake Tahoe at the foot of the Sierra Nevada and 30 miles south of Reno. It lies in a fertile region, its chief industries being mining, lumbering and agricultural operations. Besides its gold and silver mines (and here is the noted Comstock Lode), there are hot springs in the region. Settled in 1858, the town became the capital three years later, while in 1875 it received its charter as a city. Within the city are the state and federal buildings, including a branch mint, and in the neighborhood are a U. S. government Indian School and the state prison. Its population, which has declined of recent years, was in 1910 but 2,466.

**Cartagena** (*kär'tȧ-jē'nȧ*), **Spain,** an important historic town and fine seaport on the Mediterranean, in the province of Murcia, is situated in the southeast of the kingdom, south of Alicante and east of Almeria in Andalusia. Its population in 1910 was 96,983. Its harbor, which is defended by strong fortifications, is one of the best on the coast and was formerly the chief naval arsenal of Spain. In early days it was the great commercial emporium of the Carthaginians, and was founded in 242 B. C. by Hasdrubal. Thirty-two years later, it was captured by Scipio Africanus and in A. D. 550 it was destroyed by the Goths; it has otherwise suffered from invasion and capture at different eras. Today the city, which is an episcopal see, has many interesting ruins, among them the Castillo de la Concepcion, situated on a fine promontory, while notable are many of its churches (especially the cathedral, a Gothic structure which dates from the 13th century). The arsenal, docks, dockyards, barracks and hospitals, besides its foundries, machine shops, glass and smelting works and other industrial establishments, are worthy of a visit. Its exports consist of minerals, including lead, zinc, copper, silver ore, coke and coal; besides machinery, lumber, esparto grass, oranges, lemons.

**Carteret** (*kär'tĕr-ĕt*), **Sir George,** an English vice-admiral, royal lieutenant-governor of the island of Jersey in the English Channel and one of the original proprietors of the land lying between the Hudson and the Delaware, afterward named in his honor New Jersey, was born on Jersey about 1612 and died in 1680. With Lord Berkeley, a favorite of Charles the Second's court, Carteret was granted by the Duke of York (afterward James II), portions of New Amsterdam and what is now New Jersey. On the latter Carteret settled a colony, which should enjoy religious freedom and a liberal government resembling that of Maryland. The relations between the colonists and Carteret were, nevertheless, not harmonious; and portions of the lands were made over to the Quakers, ultimately, however, to revert again to the crown until the War of the Revolution.

**Car'thage** (*kär'thāj*), a city on the northern coast of Africa, the capital of one of the great empires of the ancient world. It stood on a peninsula of the region that is now Tunis, and was founded, probably, about the middle of the 9th century B. C. by Phœnicians from Tyre or from the Tyrian colony of Utica. The Carthaginians belonged to the Semitic race, and were an offshoot from the Canaanites. Vergil in his *Æneid* relates a mythical story of the unfortunate Queen Dido and the young city, but little is really known of the city's rise to power and wealth. About the 6th century it appears as the center of a great commerce and the capital of wide dominions in Africa, Sardinia, Sicily, Corsica and probably Malta. In 525 B. C. Carthage narrowly escaped destruction at the hands of Cambyses, the Persian king, and in 509 B. C. occurred her first treaty with the rising power of Rome. About this time began the contest between the Carthaginians and the Greeks for the possession of Sicily. Greece had settled a large part of that island with her colonies, and while she was engaged in her struggle with Persia, Carthage resolved to wrest Sicily from her

grasp. The first expedition was utterly cut to pieces on the same day that the battle of Salamis was fought. The war was carried on for 250 years, with long intervals of inaction and with varying success; but in 276 B. C., when the struggle closed, Carthage was strongly established in the island. But a new enemy now appeared to contest with Carthage the sovereignty of the Mediterranean, in the growing power of Rome. In 264 B. C. began the famous Punic wars. By the close of the first of these wars, in 241 B. C., Carthage had lost Sicily; but her general, Hamilcar, and his son-in-law, Hasdrubal, built up a new power in Spain, and at their death, Hannibal, the son of Hamilcar, one of the greatest generals the world has ever seen, found himself able to renew the struggle. In 219 B. C. broke out the second Punic War. Hannibal issued from Spain, crossed the Alps, descended into Italy, and, in battle after battle, with inferior forces routed the best soldiers of the ancient world. He brought Rome to the verge of ruin, but he was not supported by his own people. As Arnold the historian has said, it was the war of a man with a nation. After fifteen years in Italy Hannibal was recalled to defend his own city, and in 202 B. C. he was defeated in the battle of Zama by Scipio. Peace was concluded and the power of Carthage was broken. But Rome was resolved on the destruction of the city, and on a slight pretext declared war in 149 B. C. Three years later the third Punic War closed with the fall of the city after a siege of two years. For six days, however, the fighting went on in the streets, men and women defending their homes with fierce despair, contesting every foot of the ground. The city was, nevertheless, razed to the ground, and the country became a Roman province. Carthage became, later on, one of the chief cities of the Roman empire. In the 5th century A. D. it became the capital of the Vandal kingdom of Africa, and it was destroyed at the end of the 7th century by the Arabs. Like other Canaanites, the Carthaginians practiced a horrible form of fire-worship, human victims being offered to their chief god, Moloch. No Carthaginian art o literature remains, if, indeed, there ever existed any worthy of the name. The government was carried on by two chief magistrates and a senate of the leading families, and also by an assembly of the people, which, however, had little power. Their armies were generally made up, in large measure, of hired troops. The Carthaginians were a great trading people. Their ships sailed as far west as the Azores and as far north as Britain and th Baltic. There was in that day an immense trade with the interior of Africa as well as with the Gallic tribes. At the time of the siege of Carthage by the Romans the city is said to have had 700,000 inhabitants. See DIDO, HANNIBAL and ROME.

**Carthage, Mo.,** a city, the county seat of Jasper County, on Spring River and on the Mo. Pacific, the St. Louis & San Francisco and White River R. R's; 54 miles west of Springfield and 150 miles southeast of Kansas City. Mines of lead, zinc and cobalt and quarries of marble and limestone are worked in the vicinity; its other industries, which are flourishing, embrace the manufacture of shoes, bed-springs and plows, besides its foundries and flour mills. Many public buildings, including a courthouse, library, churches and schools add very greatly to the attractions of this progressive city; it also has two fine parks. The town was destroyed in the Civil War, but soon afterwards rebuilt. Near the city an engagement occurred between a Union force under General Sigel and a force of Confederates under Generals Jackson and Price. The result was indecisive. Population, 12,000.

**Cartier** (*kär'tyā'*), **Sir George Etienne,** Canadian statesman and leader of the French-Canadian Conservatives in the Dominion parliament, was born in 1814, and died in England, May 20, 1873. He was descended from the great navigator, Jacques Cartier. As a young man he took part in the rebellion of 1837, and had to leave the country for a while. Ten years later, after an amnesty had been issued, he entered Parliament, and in 1856 he became attorney-general for Lower Canada. From 1858 to 1862 he was premier; and in 1867, as a member of the Macdonald administration, he took an active part in bringing about Canadian confederation under the British North America Act of that year. He was made a baronet by the crown in 1868.

**Cartier, Jacques,** a French navigator, was born at St. Malo in Brittany in 1494. He was intrusted by Francis I with the command of an expedition to explore the western hemisphere, and, setting sail in April, 1534, touched on the coast of Newfoundland and discovered the mainland of Canada, which he claimed for France by erecting a wooden cross. The next year he sailed up the St. Lawrence as far as the Indian village of Hochelaga, to which he gave the name of Mont Royal, the site of the modern Montreal. In a third voyage, in 1541, he built a fort named Charlesbourg near the present site of Quebec. Whether he made any more voyages is uncertain, and the date of his death is not definitely known, though supposed to have occurred in 1557.

**Cart'ilage.** See GRISTLE.

**Cart'wright, Edmund** (lived from 1743 to 1823), the inventor of the power-loom, was born in England, and until the age of 40 devoted himself to the ministry. In 1784 he happened to talk with some men from Manchester on the subject of mechanical weaving, and, although he had never taken any interest in mechanics, he set

to work, and by April of the following year he had his first power-loom in running order. The invention was opposed both by spinners and their workmen, and the first factory was burned down. But improvements were added, and it finally made its way. Cartwright spent the remainder of his life in experiments in the use of steam-power in boats and carriages, but died without reaching any result. For his invention Parliament voted him $50,000.

**Cart'wright, Peter,** the "Backwoods Preacher," was born in Amherst County, Va., in 1785. His family moved early to Kentucky, and when about 16 he became interested in religion. For many years he preached to the backwoodsmen, and his simple, forcible and earnest words made a deep impression. In 1812 he was made a presiding elder, and spent over 65 years in different western conferences. He traveled 11 circuits and 12 presiding-elder's districts; received more than 10,000 members into the church; baptized more than 12,000 persons; and preached in all about 15,000 sermons. His story is told in his *Fifty Years a Presiding Elder* and the *Autobiography of Peter Cartwright the Backwoods Preacher*. He died in Illinois in 1872.

**Cartwright, Rt. Hon. Sir Richard John,** P. C. (Great Britain), G. C.M.G., K.C.M.G., was born at Kingston, Ont., Dec. 14, 1835, the son of the late Rev. R. D. Cartwright, chaplain to the forces, and was educated at Trinity College, Dublin. He has been in the parliament of old Canada and that of the Dominion almost continuously since 1863, was finance minister from 1873 to 1878, chief financial critic and one of the Opposition leaders from 1879 to 1896, acting premier and leader of the house of commons in 1897 and minister of trade and commerce of the Dominion in the Laurier cabinet. In 1897 he went to Washington for the promotion of better relations between Canada and the United States, proposed a joint commission, and served on the Anglo-American Joint High commission at Quebec in 1898 and in Washington in 1898-9.

**Caruso, Enrico.** Born at Naples, Italy, in 1872. The son of a mechanic, and, as a boy, working for two *lire* (40 cents) a day. With later years he developed a vibrant and expressive voice which led to his début on the operatic stage in 1896. He appeared at the Metropolitan Opera House in New York City in November, 1903, and at later dates, and has sung in South America, Russia and England. He has been decorated by the kings of Italy and Portugal.

**Ca'ry, Alice** and **Phœbe,** American authors, were born near Cincinnati in 1820 and 1824, respectively. Though receiving only a slight education, they early began to write. The poems of Alice and Phœbe Cary showed much poetic power. The two sisters removed to New York in 1852. Alice became a constant contributor to the leading magazines, and also wrote novels and poetry, which subsequently appeared in book-form. The writings of Phœbe consist mainly of poems. Both sisters died in 1871.

**Casas** (*läs kä'säs*), **Bartolomé de las,** bishop of Chiapa in Mexico, called the Apostle of the Indians, was born at Seville, Spain, in 1474. He studied at Salamanca, and with his father set out on the third voyage of Columbus, and in 1502 accompanied Nicholas de Ovando to Hispaniola. In 1511, having the year before entered the priesthood, he was sent to Cuba to help to pacify the island, and for his services he received an allotment of Indians as slaves. But soon sympathy for them in their piteous condition moved him to go to Spain and ask for a commission to investigate into their condition. He further sought that negro slaves be imported to take the place of the Indians in the heavier work and thus prevent their total extermination. He also attempted to take out Castilian peasants as colonists, but, failing in this, he retired to a Dominican convent in Hispaniola to spend eight years in solitude and study. In 1530 he again visited Spain, and after four years of missionary work in Mexico, Nicaragua, Peru and Guatemala he returned to spend four more years in the hope of gaining his purpose. During this period he wrote *Veynte Razones* (Twenty Reasons) and *Brevissima Relacion de la Destruycion de las Indias*, which has been translated into all European languages. He was offered the bishopric of Cuzco, but preferred the poor one of Chiapa, and arrived at Ciudad Real, its chief city, in 1544. Here he persisted in his campaign against the allotments of Indians, but the revocation of the new laws by Charles V caused him to resign in 1547. In 1550 he argued before a junta against Sepulveda, who advanced the right to carry on war against the Indians, and in 1555 he prevailed upon Philip II not to sell the reversionary rights of the allotments. The restoration of the court of justice to the native Guatemalans was the last act before his death, which occurred in a convent at Madrid, July, 1566, at the age of 92. See *Life* by Sir Arthur Helps.

**Cascade** (*kăs-kād*) **Range,** a range of mountains in the western part of Washington and Oregon and British Columbia, forming a continuation of the Sierra Nevada of California. It runs nearly north and south at an average distance of about 100 miles from the seacoast. The chain throughout most of its course is heavily wooded; but its chief feature is the presence of beautiful cone-shaped and perpetually snow-

clad peaks on parts of the range. There are many traces of volcanoes, and volcanic action is not quite extinct in the region of Washington. The main peaks are Mounts Tacoma (14,444 feet), St. Helen's (12,000 feet), Baker (10,700 feet), Hood (11,225 feet), Jefferson (10,200 feet) and Pitt (9,818 feet). The Cascade Mountains, geologists state, are of much more recent formation than the Rocky Mountains proper.

**Cascade Tunnel,** a great engineering feat on the line of the Great Northern Railway which was undertaken and accomplished between 1897 and 1900 after studendous labor and monetary outlay. It pierces at a high elevation the Cascade Range of the Rocky Mountains, and is in length about 2¾ miles or, with its extended shed at either end, nearly 14,500 feet. The difficulties of the task were vast, chiefly by reason of the large boulders and mass of water-impregnated gravel met with in its construction, necessitating the employment of extra concentric sets of timbers in its building and for permanent support and safety. The tunnel, moreover, had to be heavily lined with solid concrete, the pressure upon it being so great.

**Casault, Sir Louis E. N.,** was born and educated in the province of Quebec. He was a member of the Legislative Assembly of Canada 1854-8, and of the House of Commons 1867-70. Appointed a judge of the Superior Court of Quebec, 1870, and was one of the arbitrators who determined the disputed accounts between Canada and the provinces of Ontario and Quebec. He was chief justice from 1894 until his death, which occurred in 1908.

**Cashmere** (*kăsh'mēr'*), **Vale of,** or, as it is now usually spelled, Kashmir, the valley of the Upper Jhelum, celebrated in history and literature for the beauty of its scenery and the charms of its climate, lies in the feudatory state of Kashmir north of the Punjab. It extends for about 120 miles from northwest to southeast, with a mean breadth of 75 miles. The flat portion of the valley is not more than 80 miles long by 20 wide, with an elevation above sea-level of from 5,000 to 7,000 feet. In it are two lakes. It is entered by many passes, for ranges of the Himalaya Mountains traverse the country. Snow-capped mountains almost surround it, with their lower spurs descending in rice-producing, terraced slopes to the level part of the valley. On the margin of the lakes and throughout the whole valley are splendid groves of china or plane trees, here and there laid out with taste to form gardens and country seats, which two centuries ago used to be the favorite resorts of the Mogul emperors. Avenues of poplars line the river. On the surface of the lakes are floating gardens, made up of masses of growing plants from two to three feet thick. Occupying both banks of the river is the quaint old town of Srinagar, the capital. Seven log-built bridges cross the stream. The fertility of the soil is remarkable. Shawl-weaving and lacquer-work are the chief occupations of the people. Kashmir and Jammu form one of the feudatory or native states of India, with an area of 80,000 square miles and a population of about 3,000,000.

**Cash-Register.** The typical cash-register is that manufactured by the National Cash Register Company, of Dayton, Ohio, and found in so many retail stores. They serve two purposes: to check possible dishonesty of the assistants and to take the place of the cash-sale book. There are rows of keys, like those on a typewriter, but with numbers upon them; a cash drawer which can only be opened by pressing on a key; a bell that is rung whenever a key is pressed; and a sign which tells anyone looking at the face of the register what key has been struck. When anyone strikes a key, therefore, and thus opens the drawer, the bell gives notice of the fact. At the same time the customer sees whether the right amount was recorded. Finally, the machine makes a record, every time a key is struck, of the amount or number on the key; and it automatically adds them, so that at a glance the employer can see when he opens the record-box how many 5c, 10c, etc. have been received. He adds these totals into a grand total, and then checks by its aid the amount of money in the drawer. This record no one can get at without a key. In many such machines the operator can keep a separate record of the following accounts: amounts *charged; cash received;* and *cash paid out.* Thus the cash-register is a book-keeper as well as a detective. The first cash-register was that invented in 1879 by John Ritty, of Dayton, O. There are more complicated machines of the same general type for use in banks, etc. One important fact is that the machine makes *no mistakes* in adding.

**Casimir-Perier** (*kă'zē'mēr'pĕ'ryā'*), **Jean Paul Pierre,** who became the fifth president of the French Republic (1894-5), was born in Paris in 1847. He received the cross of the legion of honor for his services in the Franco-Prussian War. His grandfather had been premier under Louis Philippe, his father also had been a cabinet-minister, and it is natural that he should have chosen a political career. In 1893 be became president of the Chamber of Deputies. On the assassination of President Carnot in 1894 he was elected president. After a short and stormy administration of six months he suddenly resigned and retired from public affairs. President Casimir-Perier is said to have been ham-

pered in his policy even by his own ministers, over whose acts the constitution of the French Republic gave him but a slight control. He died March 12, 1907.

**Cas'pian Sea,** an inclosed inland sea or great salt-lake, the largest in the world, lies on the boundary between Europe and Asia. It is bounded on the south by Persia and on the north by Russia; with the Caucasus Mountains on its westward and the transcaspian territory on the east. Its length from north to south is 700 miles, and its breadth varies from 130 to 270 miles. Its total area is estimated at 170,000 square miles. On the east side, especially, there are several bays and peninsulas. On the south a low, flat plain, from 15 to 20 miles in width, leads to the lofty range of the Elburz Mountains; while the north is bordered by great steppes. The surface of the Caspian is 97 feet below the level of the Black Sea and 248 feet below that of Lake Aral. It is probable that all three bodies were once connected. The Caspian has no tides, but violent storms make navigation dangerous. Its level varies much at different seasons. In the middle it is divided by a submarine ridge, a continuation of the main Caucasus chain, into two deep basins. The greatest depth found in the northern basin is 2,526 feet and in the southern 3,006 feet. A number of large rivers empty their waters into the Caspian, of which the greatest is the Volga. The sea abounds in fish, and valuable fisheries are carried on, especially for sturgeon and salmon. By a canal uniting the upper tributaries of the Volga with those of Lake Ladoga and the Dwina, the Caspian is united with the Baltic Sea. The sea is now surrounded on three sides by Russian territory, the southern shore still remaining Persian. The Russians maintain a flotilla on the Caspian Sea, and lines of steam-packets ply upon it.

**Cass, Lewis,** an American politician, was born at Exeter, N. H., Oct 9, 1782. His family went west, and Cass studied law at Marietta, Ohio. He now entered politics is a Democrat, and played an important part in the War of 1812; was governor of Michigan and superintendent of Indian affairs for 18 years, during which time he negotiated 22 treaties with Indians and did much to open the northwest territory; he also explored the upper lakes and the headwaters of the Mississippi. Cass was secretary of war, for a long time United States senator from Michigan, minister to France and candidate for president against Taylor. In 1860 Cass differed from President Buchanan in his southern policy, and resigned his position as secretary of state, closing a public career of 54 years. He was a man of much ability, a fine scholar and an effective speaker. He was the author of several works. He died at Detroit, Mich., June 17, 1866.

**Cassandra** (*ka-san'drā*), in Homeric legend, was the fairest daughter of Priam, king of Troy, and twin sister of Helenus. The two children were left one night in the sanctuary of Apollo, and while asleep their ears were touched and purified by two snakes so that they could understand the language of birds and thus know the future. Apollo afterward taught Cassandra the secret of prediction; but she rejected his love, and as a penalty he laid upon her the curse that no prediction should ever be believed. So she in vain predicted the treachery of the Grecian horse and the destruction of Troy, and was looked upon by the citizens as mad. On the sack of the city she was torn from the temple by Ajax Oileus, and in the distribution of the spoil she became the share of Agamemnon. She was afterward murdered by Clytemnestra.

**Cassava** (*kăs'sȧ-vȧ*). This is the West Indian name of a plant that grows not only in those islands, but in Brazil, Peru and tropical Africa. In Brazil it is called manioc (mandioc), and in Peru, yucca. From its stems, branches and leaves is obtained a juice, which, though a deadly poison when fresh, quickly becomes a wholesome food when heated, and is used as a soup by the natives. From the plant also is obtained arrowroot, which is almost pure starch. Tapioca also is made from it by heating the arrowroot until the grains of starch burst, are partly converted into dextrine and come together into small lumps. The pearl tapioca which is better known to us is not obtained from this plant, but from potato starch. Another important and well known product of cassava is farina, which also is almost pure starch. This is obtained from the roots, which are grated and then dried on hot metal plates. The cassava is remarkable for its fertility.

**Cassiope'ia** (*kas-sĭ-o-pē'yȧ*), a constellation in the northern hemisphere, not far from the north pole. It is marked by five stars of the third magnitude, forming a figure like a W. In 1572 there appeared in this constellation a new star, which, when first noticed by Tycho Brahe, exceeded in brightness all the fixed stars and nearly equaled Venus. The star gradually diminished in magnitude, and disappeared in March, 1584.

**Cas'sowary,** a large running bird, native to New Guinea and northeastern Australia. Although related to the ostrich, it belongs to a different family and lives in dense forests, while the ostrich lives on open plains and deserts. It has black plumage, with a naked neck, and bright-colored (red, blue, yellow) wattles. It is about five feet high, with rudimentary wings, a swift

runner and a good swimmer. On the head is a hard bony cap or helmet. The head is carried low while running, and the vines

CASSOWARY

and branches strike this cap and slide over the back. It feeds mostly at night on fruits and berries. The birds may be tamed. If teased, they kick powerfully sideways.

**Cast,** a term applied when a work of sculptured art—a figure or a group of figures—is reproduced in plaster or, less perishably, in bronze. Famous works of antiquity are often thus reproduced when replicas (duplicates or repetitions) are made of them as models for study in schools of art or for exhibition in museums or art galleries. The process of reproduction is first to lubricate the original carefully that it may not be injured or defaced, and so that the applied plaster shall not adhere to it when it is coated with the plaster, after which, when the latter is dry, the mold or shell is removed, either whole or in parts. This cast, as it is called, when it is put together, furnishes, generally speaking, a faithful reproduction of the original, and from it repeated copies may be similarly made. When the original is designed to be reproduced in bronze or other metal, the process is termed founding, the reproduction being done from suitable molds in a foundry.

**Caste.** See INDIA.

**Castelar** (*käs'tă-lär'*), **Emilio,** a Spanish orator, statesman and writer, was born at Cadiz, September 8, 1832. He was for some years professor of history and philosophy in the university at Madrid. He took part in several political uprisings and helped to bring about the downfall of King Amadeus in 1873. Castelar became dictator, but, when Alphonso XII became king, he fled across the frontier. He returned to Spain in 1876 and devoted himself more to literature than to political and social questions. He died in 1899.

**Castile.** See SPAIN.

**Castor-Oil,** a familiar and simple purgative, derived from the seeds of the castor-oil plant (*Ricinus Communis*), a native of the Indies. Used as a laxative, it has a nauseous smell and disagreeable taste, which can, however, be partially overcome by using it in capsules of gelatin or by floating the oil on hot coffee. It is considerably

CASTOR-OIL PLANT

used in the arts as a lubricant for machinery, while in the East Indies it is employed as an illuminant as a lamp-oil.

**Cas'tor** and **Pol'lux,** often called Sons of Zeus, were, according to Homeric story, the brothers of Helen of Troy; but another tradition makes them only half-brothers of Helen, their father being Zeus; while still a third account makes only Pollux Zeus's son, and so he alone was immortal. Castor was famous for his skill in managing horses; Pollux for his powers in boxing. Both received divine honors at Sparta as patrons of travelers by sea. They assisted at the battle (496 B.C.) of Lake Regillus. Zeus placed the brothers among the stars. They are the principal stars in the constellation of *Gemini* or the twins. Their names are also given to the electric appearance known as St. Elmo's Fire.

**Cat,** the name of a family which includes besides the wild and domestic cat, such animals as the lion, tiger, leopard, puma, jaguar, cougar or American panther, etc. The wild cat of Europe is larger and stronger

than the house cat, with yellowish-gray fur and dark stripes down the back, along the sides, across the legs, and rings on the tail. In common with all the wild members of the family, it is very fierce in disposition. The animal called wild cat in America is a lynx. The common domestic cat probably is a descendant of the Egyptian cat, which was tamed 13 centuries B. C. From Egypt it was carried into Europe, but was long scarce and very expensive. There are many varieties of cats. Some of the best known are the fawn-colored, royal Siamese cat, with blue eyes and small head; the Maltese cat, of a bluish-gray color; the large Angora or Persian cat, with long, generally whitish fur; and the beautiful Spanish or tortoise-shell cat. The Manx cat of the Isle of Man is tailless and has very long hind legs. In cats the senses of sight, hearing and touch are very highly developed, and the intelligence also is great. Their whiskers are sensitive hairs, and the pupil of their eye expands in the dark, enabling the animal to see with a small amount of light. The habits of domestic cats are well known, and they do many clever things. From early times cats have been the objects of superstition. In Egypt they are held in the highest reverence, and sacrifices were offered to them. In the middle ages they were believed to be the friends of witches, and the favorite shape of Satan was said to be that of a black cat. See Mivart's *The Cat* (1880) and Champfleury's *Cats, Past and Present* (1885).

**Cat'acombs** are ancient underground places for burying the dead. Those in Egypt, the burial places of the ancient kings, are very remarkable; but the most important are the famous Roman catacombs. These are to be found on almost all the roads leading out of the city, at a distance of two or three miles outside of the walls. More than 40 of these cemeteries are known to have existed, and two thirds of these were of considerable extent; and, if the galleries were extended in a straight line, they would reach at least 300 or 400 miles. Many of them are very old having been originally quarries; but a large number were dug solely for the purpose of burial and as places of worship. Each catacomb forms a network of passages or galleries, usually eight feet high by two or three wide. The graves are in tiers on the sides, and when undisturbed are found closed by marble slabs or tiles, on which are often found inscriptions or Christian emblems. The catacombs were used by the Christians during the ages of persecution as places of burial and also of worship; but the use of them was at various times forbidden, and at the beginning of the 5th century the practice of burial there entirely ceased. When the ages of persecution came to an end, a new era opened in the history of the catacombs. Christian pilgrims flocked from all lands to see them and to do honor to the martyrs entombed there. Some of the more important tombs were decorated with marble and some with gold and silver. In the 6th and 8th centuries they were ravaged by the Goths and Lombards, and in consequences the sacred relics were removed to the churches. The catacombs then fell into neglect, and were almost forgotten by the Christian world. They were at this time thronged with outlaws and assassins. They were again somewhat cleared, and in 1578 an accidental landslip brought them to light and they soon attracted universal attention. They have since been much studied and written about. Other catacombs are those of Naples, Syracuse and Malta. The so-called catacombs of Paris are simply old quarries under the city, to which the contents of graveyards have been removed.

**Catalani** (*kă-tà-lä'nē*), **Angelica,** an Italian singer, was born in 1779 near Ancona, and in her seventh year displayed such wonderful powers that strangers flocked from all quarters to hear her. She began her professional career at Venice when 18 years old, and for more than thirty years passed through a series of triumphs in every country in Europe. Her large, queenly person and fine countenance, the immense volume and range of her voice and at the same time her lightness and ease in its use everywhere took her audiences by storm. She twice directed the Italian opera in Paris. She bought a villa near Florence after retiring from the stage, where she gave free instructions to girls who had a talent for singing. She died in 1849.

**Catalonia,** a former province of Spain, in the northeast of the kingdom and situated south of the Pyrenees, east of Aragon, and bounded on the south by the Mediterranean. It to-day comprises the provinces of Gerona, Lerida, Tarragona and Barcelona. Its area is 12,480 square miles, and in 1910 it had a population (known as Catalans) of 2,075,033. It is the chief agricultural and manufacturing district of Spain. The soil is productive in the valleys, where grain, flax, grapes and fruits are raised, while much of the region is rich in minerals, including iron, copper, zinc, coal and marble. The principal seaport and seat of Spanish commerce is Barcelona; population (1910), 560,000.

**Catalpa** (*kà-tăl'pà*), a kind of tree of which there are seven or eight species, two being found in the United States. The common catalpa is a native of the southern part of the United States, and is cultivated as an ornamental tree in most of the cities of the northern states. It has silver-gray bark, and its showy flowers are white, slightly tinged with purple and violet in the throat. The flowers are followed by

1 White Persian 2 Light Silver 3 Cream Persian 4 Siamese 5 Silver Persian
6 Short Hair Tortoise Shell

A GROUP OF LIONS.

ROYAL BENGAL TIGER

LEOPARD.

pods, often a foot in length, which hang until the next spring. In its natural locality this tree seldom exceeds 40 feet in height. The wood is light in color and coarse-grained, and is used in exterior finish, for fence posts and railroad ties. It is known by various names, as Indian bean, candle-tree and bean-tree. Catalpas belong to the *Begonia* family.

**Catania** (*kà-tā'nē-à*), a city and seaport of Sicily, near the foot of Mt. Etna. The fertile and well-cultivated plain of Catania is styled the granary of Sicily, and has given the city the title of Beautiful Catania. By eruptions of the great volcano and by earthquakes, the city has been several times almost entirely destroyed, but out of its ruins it has always risen with increased beauty. It now is the finest city of Sicily, being built throughout on a beautiful and uniform plan. Among the chief buildings are the Benedictine convent of San Nicola, the cathedral, founded in 1091, and the university, founded in 1434, which has a faculty of 48 professors and 1,048 students. There are manufactures of silk and linen goods and of articles in amber, lava, wood, etc. There have been some remains of ancient times found here, including those of a theater, a temple of Ceres, Roman baths and an aqueduct. Catania was founded by the Greeks in the 8th century B. C., and became a flourishing city. It was desolated by Dionysius I, but again rose under the Roman sway. It was destroyed by earthquake in 1909. Population, 211,699.

**Catapult** (*kăt'à-pŭlt*), an ancient military engine for throwing stones, arrows, javelins and other missiles. It was invented in Syracuse in the reign of Dionysius the Elder. It consisted of a wood framework, a part of which was elastic and furnished with tightly drawn cords of hair or gut. It acted on the principle of a bow. Catapults were of various sizes. The largest would throw a beam six feet long and weighing 60 pounds to a distance of 400 paces.

**Cataract.** See WATERFALL.

**Catawbas** (*kà-tą'bàz*), a tribe of Indians in North and South Carolina, now reduced to a mere handful. When these states were settled, they were a powerful tribe with 1,500 warriors. They occupied six towns on Catawba River. They were a warlike people, early engaged in strife with the Cherokees and later with the Shawnees and Iroquois, but were freindly to the settlers and served with them in the Revolution. They retired on a reservation, and have since decreased greatly. There are now about 200 half-breeds in the reservation bearing the name. Pontiac is said by some to have been by birth a Catawba. The last full-blooded Catawba, Peter Harris, was a Revolutionary soldier.

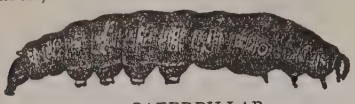
**Cat'bird,** a very common, well-known bird in the United States, related to the southern mocking-bird and other thrushes. The ordinary song of the male during the mating season is musical and agreeable, but both male and female utter on occasion a disagreeable cry, like the mewing of a cat, and from this their name is derived. The bird is slaty-gray with black cap and tail. It nests in thickets and shrubbery near settlements, seldom more than four or five feet from the ground. The nest is a bulky affair of twigs, leaves, grasses and fine roots. The four or five eggs are of a bluish-green color. The bird arrives in New England in May, and departs for the south the middle of October.

CATBIRD

**Caterpillar,** the immature stage of butterflies and moths, intermediate between the egg and the perfect insect. What the tadpole is to the frog, the caterpillar is to the butterfly or moth. They are both called larval stages, and when the extensive change takes place, transforming them into adult stages, it is in both cases called a metamorphosis. (The metamorphosis of insects is general and by no means confined to butterflies and moths). The butterfly or moth deposits eggs, which, in place of hatching in the form of the parents, hatch as worm-like caterpillars. But caterpillars, although worm-like in form, are not worms; they are immature stages of insects. They all have three pairs of jointed legs like insects (also additional false-legs or supports), and all breathe by air-tubes like insects. Caterpillars vary greatly in form, size and coloring. There are the common heavy or woolen varieties, and many others that are unprovided with hair but usually with bright colors. The common measuring-worms, the large green tomato-worms, the striped, spotted, and various-colored worms found on milkweed, tobacco, apple-leaves, mulberry and other plants are illustrations.

The rearing of these larvæ, in order to watch the changes, is now a common thing; boxes open to the air, but provided with wire screens, are used. Into these are placed the larvæ and some of the leaves of the plant on which they are found, and these are renewed from time to time. They will grow in the boxes so tended, and, when they have reached their full growth, will pass into the stage of a pupa or chrysalis. The latter vary also greatly in form and appearance. Some kinds spin cocoons around themselves, others draw the skin over the back and form a sort of case into which they retire.

Some, like the tomato worm, burrow into the earth, and there form a dark brown case,



CATERPILLAR

provided with a long, slender, curved handle; the resemblance of the whole structure to a brown jug gives this form the not inappropriate name of the jug-handle. Inclosed within the handle is the sucking tube of the mouth. The chrysalids formed upon bushes are often ornamented with bright golden metallic spots. The cocoons of the silkworm are the ordinary cases of the chrysalids of that moth. What takes place within the cocoon is not thoroughly understood, but the living part of the body is all worked over. Disks appear upon the caterpillar, from which grow the wings, legs and other parts of the perfect insect. The period of residence within the cocoon is not one of sleep and no change, but a period of reconstruction and great changes. Shut up within the cocoon the new organs of the perfect insect are constructed out of the old ones of the larva. It is one of those marvelous changes which take place continually in the world of life. It is a development parallel to the development within the egg, but of a different character.

Caterpillars are preyed on by birds and other animals, but these apparently defenseless creatures have means of protecting themselves from their natural enemies. Sometimes they are covered with stiff hairs or sharp points, making them disagreeable to swallow. Some, by reason of secretions, have an unpleasant taste or odor, and birds soon learn to leave them alone. Sometimes the harmless forms assume the colors of the harmful kinds, mimic their movements and thereby save their own lives. The bright colors of the poisonous or unpleasant ones are called warning colors. Others still are protected by resembling in color and markings the objects on which they live and so escaping notice. Caterpillars often are very destructive. The woolen moth has a small, worm-like larva, that feeds on woolen fabrics, furs, etc. The yearly injury to crops is enormous. The sole business of the larvæ is to eat and grow, and they may eat many thousand times their weight before going into the chrysalis state. The destruction caused by the army-worm is very great. The loss from the cotton-worm in one year was above thirty million dollars, as estimated by authorities of the United States government.

**Catfish,** a common food-fish, with large head and slender barbels about the mouth. The latter, from a fancied resemblance to the whiskers of the cat, give the name. The common catfish of the United States is abundant in sluggish waters and is called bullhead and horned pout. It is a homely fish, of dark color, and has no scales. It has sharp spines near the front fins and one on the back, that make painful wounds. Some varieties grow to large size; the black-cat of the great lakes exceeds a hundred pounds in weight, and the ponderous cat of the Mississippi reaches a weight of two hundred pounds. There also are catfish in salt water.

**Cathay** (*kà-thā'*), the name applied to China by the western nations of Europe in the middle ages, is a term now seldom employed except in poetry and rhetoric. "Better fifty years of Europe than a cycle of Cathay" writes Tennyson in *Locksley Hall.* See CHINESE EMPIRE.

**Catherine de Medici** (*dă mă'dē-chē*), wife of one king of France and mother of three, was born at Florence, in 1519, of a famous Florentine family. When fourteen, she was married, as the niece of Pope Clement VII, to Henry, the second son of Francis I of France. Her influence was not felt until her eldest son, Francis II, became king in 1559. The great Catholic family of the Guises, on the one hand, and the Huguenots, on the other, were both becoming so powerful as to overawe the crown. The able Catherine, having the reins of government in her own hands, partially, under Francis II, and wholly, under the weak-minded Charles IX, played off these great parties against each other. It was one of these intrigues which caused the fearful massacre of St. Bartholomew's Day. The elevation of her third son to the throne of Poland and the death of her fourth son were brought about by her intrigues. Under Henry III she was almost as powerful as she had been before. But in a few years she and her son, having betrayed those who trusted them, found themselves abandoned by all. The great Catholic League, with the Guises at its head, and the Protestants, headed by Henry of Navarre, equally distrusted them. Catherine died unheeded and unmourned in 1589.

**Catherine of Aragon** (*ăr'ă-gŏn*), queen of England and first of the six wives of Henry VIII, was born in 1485 and died in 1536. She was the fourth daughter of Ferdinand, King of Aragon, and of Isabella of Castile. While scarcely sixteen she was married to Arthur, Prince of Wales, son of Henry VII, but by his decease a year later Catherine was left a widow. In 1509, on Henry VIII coming to the throne, she became his wife, having some years before received the papal dispensation. With Henry she lived happily for about twenty years, but the want of male issue, together with the king's passion for Anne Boleyn, one of Queen Catherine's maids of honor, led to a dissolution of the marriage, which Cranmer declared a nullity, though the pope refused to sanction the divorce and thereby hastened the rupture between the English Church and the Church of Rome. The grief-stricken queen

retired into privacy, and led an austere religious life until her death in 1536, three years after Henry's marriage with Anne Boleyn.

**Cath'erine II,** Empress of Russia, was born at Stettin in 1729. The daughter of a Prussian prince she was chosen by the Empress Elizabeth as the bride of her nephew and heir Peter. She had many quarrels with her husband, and each led a life of open vice. In 1761 Peter III ascended the Russian throne. An attempt of the new and unpopular tsar to divorce Catherine brought about a conspiracy, which dethroned and murdered him. It is pretty certain that Catherine had a share in the murder. Catherine's reign was energetic, and remarkable for the rapid increase of the dominion and power of Russia. Her two wars with Turkey, the three partitions of Poland and the acquisition of Courland (a southern Baltic province) each brought great additions of territory and prestige. She made some attempts at making the country more free, but Russia was not yet ripe, and they did not outlive her. She died at St. Petersburg in 1796.

**Catherine Howard.** See HOWARD, CATHERINE.

**Catherine Parr.** See PARR, CATHERINE.

**Cathode Rays** (*kăth'-ōd*), a phenomenon accompanying electric discharge in a vacuum tube in which the pressure is something less than one one-thousandth of a millimeter of mercury. The wire by which the electric current enters the tube is called the *anode:* the wire by which the current leaves is called the *cathode.* When the region between the anode and cathode is a perfect vacuum, the walls of the vacuum tube exhibit a brilliant phosphorescence, as if they were bombarded by particles which are projected from the cathode. These particles appear to travel in straight lines from the cathode to the walls of the glass tube; for if a screen be placed in the region between the cathode and the wall, a shadow geometrically similar to the screen is cast on the wall. Another remarkable property of the cathode rays is that they are deflected from their rectilinear paths by a magnet. In this respect they behave as if they were flexible electric conductors. It was this fact that led Crookes to suppose them negatively electrified particles shot from the cathode. Most interesting of all, perhaps, is the fact, discovered by Roentgen in 1895, that whenever cathode rays strike the walls of the vacuum tubes they give rise to X-rays. See ROENTGEN RAYS.

**Catholic University of America,** a Roman Catholic institution of higher learning at Washington, D. C., which dates from 1887 and has a number of colleges in various sections of the country affiliated with it. It has received several goodly money gifts towards its endowment and maintenance, and is under a chancellor, rector and governing body. Under its various faculties in theology, philosophy, law and technology the university has a teaching staff of 30 professors and instructors with about 160 students; it also has a good, well-equipped library, and maintains a quarterly bulletin giving information on the subjects treated in the curriculum of studies. It has a number of endowed chairs and also several endowed scholarships. Its present rector or president is the Rt. Rev. Dennis J. O'Connell, and its chancellor is Cardinal Gibbons.

**Catiline** (*kăt'ĭ-līn*), **Lucius Sergius,** a Roman conspirator, was born about 108 B. C., of a noble family. He was able to bear great fatigue; he was masterful and resolute in mind; his face looked reckless and haggard; and he seemed in later life to be in a constant fever of disappointed ambition. After an ill-spent youth and the bloody successes of Sulla's party, in which he had taken an eager part, he was made governor of Africa in 69. The next year, ruled out as a candidate for consul because of charges of misrule in his province, he formed a conspiracy against Rome. The first project was to kill Cicero, the famous orator, whose murder was to be the signal for revolution. This was told Cicero at once by a Roman lady, Fulvia, whose lover was one of the conspirators. Cicero frustrated their design easily. The next step was a secret meeting, on the night of Nov. 6, 63 B. C., at which Catiline explained a new project for murdering Cicero, for bringing up to the city an army which he had won over and for setting the city on fire. Yet in a few hours Cicero knew every word spoken, and when, two days later, Catiline recklessly took his seat in the senate, the orator arose and, pointing his finger at the traitor, made his famous speech, in which he told the senate even the smallest details of the conspiracy. Catiline tried to reply; but, drowned by cries and hisses, he rushed out of the senate and escaped from Rome by night. An army was sent against him, and after a battle, in which he fought with the greatest bravery and desperation, Catiline was defeated and slain in 62 B. C.

**Cat'kin,** the characteristic flower-cluster of the birches, alders, willows, etc. See INFLORESCENCE.

**Ca'to** (*kā'tō*), **Marcus Porcius** (surnamed The Censor), was born at Tusculum in 234 B. C. Marcus Porcius was his proper name. Cato, meaning wise, was a title given him later in life when he held office as censor. He spent his boyhood on his father's farm, and there learned simple manners and ways of living. When 17, he served with great bravery in the army against Hannibal. At the same time he was becoming known as an orator and statesman. Because of his ability and uprightness, he was made consul in 195 B. C., though his family was

unknown. Made, the next year, governor of Spain, he showed such skill and vigor in putting down a rebellion there, that the people gave him a military triumph on his return to Rome. In 184 he was chosen censor, and at once became very active in using his office to carry out his ideas of simplicity, of honesty in government and of dislike of everything which was new. He put the water-courses, reservoirs and drains in good order; had the taxes collected more cheaply; saw that less money was paid for building the great public buildings; and decided what price should be paid for slaves, clothes, furniture, carriages, etc. Rome was growing rich from the spoils and plunder of her successful wars, and the Romans had caught from the Greeks a liking for fine clothes, great palaces, many slaves and all that made up luxury in life. These new ways of life Cato despised and fought against. The famous saying, "Carthage must be destroyed," which became a battle-cry of the Romans, was first used by Cato, who never made a speech in the senate without using the appealing, insistent words to inflame the ambitions of the Roman people. He died in 149 B. C.

**Ca'to, Marcus Porcius,** called **Cato the Younger,** the great-grandson of the elder Cato, was born at Rome in 95 B. C., and committed suicide in North Africa in 46 B. C. When only 14 years old, he went with his tutor one day to call upon Sulla, and, seeing the heads of several famous men, who had been put to death by the tyrant, carried away from the house, he asked why some one did not kill him. His tutor answering that no one dared to do so, he exclaimed that he would do it himself, if he would give him a sword. He greatly admired his great-grandfather, and took him as his model in life. He was rich, but lived in a simple manner, always walking instead of riding, wherever he went, and often going barefoot.

He held the office of quæstor, and carried through so many needed reforms that when he left office, he was praised by all classes of citizens. He was an open enemy of the three most powerful men in Rome, Cæsar, Pompey and Crassus, who, he foresaw, would destroy the republic, as they did when they formed the first triumvirate or government of three. Cæsar he had denounced years before as a friend of the traitor Catiline, and after the battle of Pharsalia he set out to join Pompey, now the defeated rival of Cæsar, but, hearing of his death, fled to Africa. He wished to defend Utica, but on the approach of the conqueror the citizens refused to fight. Cato, disdaining to surrender, killed himself after spending the evening talking with his friends and reading Plato's *Phædo*. His death was for two centuries regarded as the right death for a Stoic by the noblest of Romans.

**Catskill Mountains,** a group of mountains in New York, west of the Hudson River and south of the Mohawk. They form part of the Alleghenies, and cover an area of about 5,000 square miles, some peaks being 4,000 feet high. The scenery among the deep valleys with their precipice-like walls is fine and often grand.

**Cattle,** a term sometimes used to include all domestic quadrupeds, but usually applied to those of the bovine family, the ox and the cow, the most useful to man of all domestic animals and probably the first to be domesticated. In all ages and in all countries the ox has been employed as a beast of burden and of draught. Its chief value, however, is found in the fact that, aside from grains, it furnishes to mankind the chief articles of food, meat, milk, butter and cheese. The cow is the poor man's dependence in every clime and, as the basis of the meat and dairy industries, is a large factor in the commerce of the world. Modern husbandry has been wonderfully successful in improving the breeds of cattle along two distinct lines, developing certain breeds for the production of beef and other breeds for dairy purposes. Among the former the most notable are the Shorthorn or Durham, Hereford, hornless Angus, Galloway and Redpolled breeds. All of these breeds are characterized by heavy, square bodies, frequently reaching a live weight of two thousand pounds or more, and are fattened for market at a much earlier age than formerly. Among the dairy breeds are the Holstein, noted for the production of large quantities of milk, the Jersey, celebrated for the rich quality of the milk given, the Ayrshire and the Alderney. Each of these breeds has its champions, and for each special qualities of superiority are claimed. See AGRICULTURE, BUTTER, DAIRY-FACTORIES, MILK and MEAT-PACKING.

**Catullus** (*kă-tŭl'lŭs*), **Gaius Valerius,** a celebrated Roman lyric and elegiac poet, supposed to have been born at Verona, Italy, B. C. 87, and to have died about B. C. 54. What is known of his life is chiefly derived from his writings, which consist, to some extent, of amatory poems addressed to one Lesbia, of his journeyings and pleasant home life at a villa (modern Sirmio), on Lake Benacus (now Lago di Garda). He is known to have had Cicero, Cæsar, Cinna and Cornelius Nepos among his intimate friends. He has great versatility and sprightliness, with the Greek lyric spirit and beauty of expression.

**Caucasian** (*kạ-kā'shan*) was the name adopted for one of the main race divisions of mankind; but later, mainly because of the difference in the languages spoken, the Caucasian has been broken up into two groups, the Aryan and the Semitic

peoples. Caucasus was a misnomer, as there was no connection in race between the Aryan, the Semitic and the 16 or more distinct races of the Caucasus Mountains. The word is now used for the fair type of man as opposed to the black, the red and the yellow type; but it is understood not to imply any common race or language in the peoples included under the name.

**Caucasus** (*kạ'kà-sŭs*), a mountain range which occupies the isthmus between the Black and Caspian Seas, its general direction being from west-northwest to east-southeast. It is about 750 miles long by 150 miles broad. There are at least six peaks over 16,000 feet high; Mt. Elburz, 18,000 feet, is the highest. There are but few glaciers, very little perpetual snow and no active volcanoes, though Elburz and other peaks are of volcanic formation; while there are hot springs and mud volcanoes at each extremity of the range. There are but two roads across the Caucasus, the Derbend Pass and the fine military road built by the Russians through the Dariel Gorge. The Caucasus has been called the mountain of languages, from the many tongues, distinct from one another, having little or no likeness to any other languages on the globe, which are spoken in this narrow area. Some 16 or more distinct and well marked races, including the Georgians, Circassians, etc., are found in the region of the Caucasus. For over 50 years this region resisted the advance of Russia; but with the capture of Schamyl, the prophet-chief of the Lesghians, who had withstood the armies sent against him for 20 years, the power of the Caucasians was shattered. Since 1871 the country has been wholly under the dominion of Russia.

**Caucus** (derivation doubtful), in politics, a term applied to designate a conference, generally preliminary to a subsequent public meeting, of men who desire to select delegates, nominate certain party representatives for office or take certain action in regard to some public question, give shape to and outline proposed later legislation, as well as to ascertain and discuss the views of those so called together in preliminary and sometimes secret council. The deliberation is one usually held to promote unity among members of the same party, in regard to public measures, and suggesting the line to be taken in advancing such, or possibly, in balking and defeating them, if objected to or deemed unwise and inexpedient.

**Cau'licle** (in plants), a name formerly applied to the hypocotyl, that is the stem-like part of a seedling, which appears below the first leaves or cotyledons. See EMBRYO.

**Cavalier** (*kăv'à-lēr'*), meaning horseman at first, but afterward it came to mean gallant, and was so used by Shakespeare. In the struggle between Charles I and Parliament in 1641, the courtiers were nicknamed cavaliers, while the friends of Parliament were called Roundheads. At first applied in derision it was held as a title of honor, until after 1679 when it was replaced by the term Tory.

**Cavalry.** See ARMY.

**Cave-Men,** prehistoric dwellers in caves or caverns, usually convenient to streams of water. Their homes have been traced in Belgium, France, Switzerland and also in Britain, and in their cave-shelters have been found primitive tools and weapons and the teeth and bones of the animals on which they rudely subsisted. Their era appears to have been the paleolithic or stone age. They were a tall, powerful race, fitted well for their early rude environment, primitive in their manner of life, and without skill to fashion or invent any but the simplest weapons and utensils They were ignorant of the metals, of pottery and of agriculture, and had no domestic animals.

**Cav'endish, Henry,** a distinguished English chemist and physicist, born at Nice, Oct. 10, 1731, died Mar. 10, 1810. His most important work includes the discovery of the composition of water; the composition of nitric acid; and the determination of the mean density of the earth. Since the discovery of argon by Lord Rayleigh, it has become evident that Cavendish in his studies on the composition of air had, at that early date, isolated argon, but without knowing it. Cavendish was never married. He was a man of great wealth, leaving a private fortune of between three and four million dollars.

**Cavite** (*kà-vē'tā*), Philippine Islands, a province and city in Luzon Island, on the southwest side of Manila Bay, seven or eight miles southwest of Manila. Since the Philippines were ceded to the United States in Dec. 1898, after the close of the war with Spain, Cavite harbor, which is strongly defended, has become the chief naval station of the archipelago. There, on May 1, 1898, an American squadron under Admiral Dewey destroyed a Spanish one under Admiral Montojo. Besides the docks, repair shops and government-buildings, Cavite has an arsenal and in the town a hospital, several convents and churches, together with an extensive tobacco factory. The area of Cavite province is 500 square miles and the population of the city (1907) about 4,500.

**Cavour** (*kà'vōōr'*), **Camillo Benso, Count di,** the restorer of Italian unity and nationality, was born at Turin, Aug. 10, 1810, of an old noble family of Piedmont. He was a student of the military school, and when only 16 was made an officer of engineers. At an early age he was stirred with a desire to improve

the condition of his country; and for 16 years he studied, traveled and observed the workings of other governments. In 1847 he, with Count Balbo, founded a newspaper in favor of a freer form of government for Sardinia, based on that of England. A year later he entered Sardinian politics, was made premier in 1852 and until his resignation in 1859 was the originator and director of the Sardinian policy. He greatly improved the financial condition of the country and made Sardinia a power of some account in Europe. It was through his advice that Sardinia took part in the Crimean War, and this gave him a chance to bring the question of unity for Italy before the nations of Europe. In 1858 he had a secret meeting with Napoleon III and drew up a plan for driving Austria out of Italy, which resulted in breaking the power of Austria in the Italian peninsula; but Cavour was so disappointed at her being left in possession of Venetia by the peace of Villafranca that he resigned. But the next year found him in office again, striving to attain his object more earnestly than ever, and this time more successfully. Parma, Modena and Tuscany came into union with Sardinia under King Victor Emmanuel. He secretly encouraged the expedition of Garibaldi, which freed Sicily and southern Italy. In 1861 an Italian parliament was summoned and Victor Emmanuel made king of Italy. Rome and Venetia only were wanting, and they were won with a little patience. The strain, however, was too much for him, and he died on June 6, 1861. His last words were: "Brothers, brothers, the free church in the free state."

**Cawnpore** (*kạn'pōōr'*), a city of India, on the Ganges, 42 miles southwest of Lucknow. It became a British possession in 1801, and is now a garrison town for British troops. Cawnpore also is a district in the Allahabad division of the northwest provinces of British India. At the outbreak of the mutiny in May, 1857, there were 1,000 Europeans in Cawnpore, 560 of whom were women and children. Behind hastily thrown up intrenchments the few defenders held out for three weeks against the overwhelming numbers of mutineers led by Nana Sahib, when they surrendered on promise of a safe-conduct to Allahabad. The Sepoys marched the men to the banks of the Ganges, but hardly had the prisoners embarked, when the Sepoys opened fire on them and only four escaped. Hearing that General Havelock was within two days' march of the place, Nana Sahib went to meet him, was driven back, and, on reaching Cawnpore, in his rage he ordered the women and children to be massacred at once. Dead and dying they were thrown into a well. A memorial arch was erected over the intrenchments and a mound raised over the well. Population, 197,170.

**Cax'ton, William,** the first English printer, was born in Kent about the year 1422. He served as an apprentice and prospered in business. About 1476 he set up his wooden printing press at Westminster. He had learned to print at Bruges, and in 1474 printed there the first book issued in English, but the *Dictes and Sayings of the Philosophers,* brought out in 1477, is the first book certainly known to have been printed in England. His industry was wonderful. His own translations filled more than 4,500 pages, while his press turned out over 18,000 folio pages. The books he printed are to-day held as great rarities, and the few copies still left are worth many thousand dollars each. He died in 1491 or 1492.

**Cayuga** (*kā-yōō-gȧ*) **Lake,** an attractive body of water in central New York on which the towns of Ithaca, Aurora and Cayuga are situated. The lake has a high elevation, and is drained by the Seneca and Oswego Rivers into Lake Ontario. It is about 35 miles in length, varies from one to three miles in width, and is traversed in the season by steamers plying on it between Ithaca and Cayuga Bridge. It is the resort of many tourists and summer visitors.

**Ce'dar** (*sē'dēr*), species of the genus *Cedrus,* which belongs to the *Conifers.* They are large and ornamental trees, being native to northern Africa, Asia Minor and the Himalayas. The great durability and firmness of the wood are highly esteemed qualities. The native African species, *C. Atlantica,* is the only one hardy enough for cultivation in the northern states. The cedar of Lebanon, *C. Libani,* is well-known, in maturity forming a tree with broad head, differing decidedly in appearance from the pyramidal form of the African species. Although true cedars are not native to America, there are several native conifers which are commonly called cedars. For example, *Thuja* is known as *arbor vitæ* or white cedar; *Chamæcyparis* is called southern white cedar; while a species of juniper (*Juniperus Virginiana*), with odorous red wood, is universally known as red cedar and is used in large quantities in the manufacture of lead pencils.

**Cedar Mountain,** a cone-like hill in Culpeper County, Virginia, where was fought a spirited battle, Aug. 9, 1862, between the Union troops under Gerneral Banks and the Confederates under General Jackson. Near evening Banks fell back to join supports forwarded by General Pope, who was in command of the Army of Virginia, leaving the Confederates in possession of the battlefield. The Confederates did not keep their ground, but, falling back, joined the main force under Lee two days

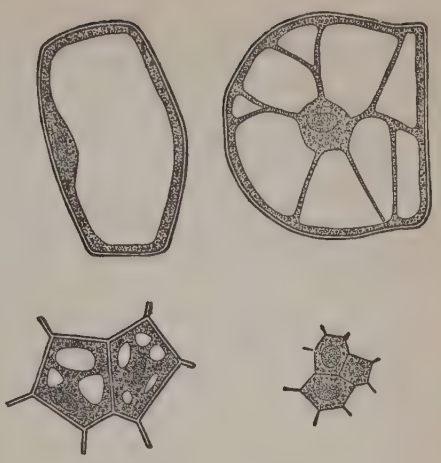
later. The Confederate loss was 1,314; the Union loss about 1,800.

**Cedar Rapid** or **The Cedars.** An extensive rapid on the St. Lawrence River, now avoided by the Soulanges Canal, and the name of a village on the northern bank of the river, in Soulanges County, Quebec. Here Capt. Forster with a small band of regulars and Indians captured the garrison of 400 Americans in their retreat from Quebec in May, 1776. A force under Maj. Sherburne was also defeated after a spirited engagement, and the survivors made prisoners.

**Cedar Rapids, Ia.,** a city in Linn County, on Cedar River. It is a considerable railroad-center, and has a number of machine-shops, employing about 1,000 men. The water-power utilized by its manufactories comes from the Cedar River. Its industries are pork-packing and the manufacture of flour, pumps, furniture, agricultural implements, starch, creamery, egg and dairy products. Cedar Rapids is the home of the American Cereal Co. and the Pawnee Cereal Co., which together have a daily capacity of thousands of barrels of cereals and give employment to hundreds of people. The city has the service of four railroads, excellent public schools, a public and also a Masonic library, etc. Population, 32,811.

**Celebes** (*sĕl'e-bēz*), an island possession of the Netherlands in the East Indies, lying between Borneo on the west and the Moluccas on the east. It was first visited by the Portuguese in 1512, but in 1660 was taken and occupied by the Dutch. The center and north of the island are mountainous, and have deposits of gold, copper, tin and diamonds. It is rich in forest wealth and its vegetation is luxuriant. The area of Celebes is 49,390 square miles, with an estimated population (1900) of 454,368. Among its chief products are coffee, sugar, indigo and tobacco. The capital is Macassar, situated on the southwestern peninsula. The Celebes Sea, on the north of the island, separates the latter from the Philippines; the Strait of Macassar on the west separates it from the island of Borneo.

**Cell** (in plants), the unit of structure in the bodies of plants and animals. The bodies of the smallest plants consist of a single cell, while those of the more complex plants consist of very many cells. The free cell is approximately globular in outline, but if pressed upon by neighboring cells it may become variously modified in form. Bounding the ordinary plant-cell, there is a thin elastic wall composed of a substance called cellulose. This cell-wall forms a delicate sac within which there exists the living substance called protoplasm. It is this substance which is alive and works, and has really formed



PLANT CELLS OF DIFFERENT AGES

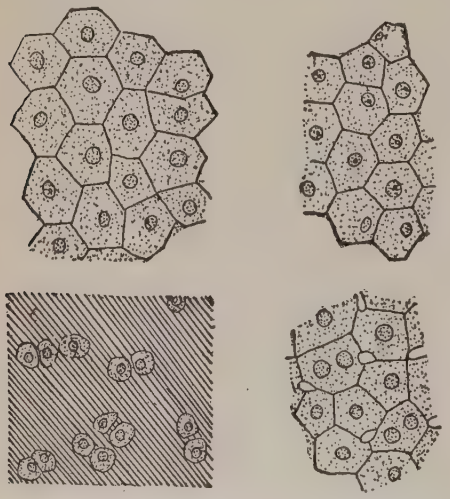
the cell-wall about itself. The protoplasm of a living cell is organized into various structures, which have different duties. One of the most conspicuous structures is a more compact mass of protoplasm, usually of spherical form, which is called the nucleus. The nucleus is imbedded in the less dense protoplasm, which receives the general name cytoplasm. In addition to its power of growth the living cell is also able to divide itself into two cells. The process of ordinary cell-division is an exceedingly complicated one, and is known as mitosis or karyokinesis. It is this power of self-division which enables a single cell, such as an egg, to produce eventually a complex body composed of numerous cells. JOHN M. COULTER.

ULOTHRIX, SHOWING THE FORMATION, ESCAPE AND BEHAVIOR OF SWIMMING CELLS

**Cell-Doctrine,** the doctrine that all the tissues of animals and plants are constructed of cells. It unites living beings on the broad ground of similarity of structure, and, for the understanding of animals and plants, is one of the most important advances of the nineteenth century. The cells are the little particles that are fitted together to make the tissues, and, therefore, we may speak of them as the bricks of organic architecture. Not only are the parts of animals and plants constructed of cells, but every living being, no matter how complex, arises from a cell. The doctrine, therefore, is a broad one, and tends to unify knowledge.

Let us see some of the facts upon which this conclusion rests: If a very thin slice of a plant-stem be examined under the microscope, it will be found to be constructed of small units fitted together. If the outer epidermis of a leaf be stripped off and properly magnified, it will likewise show cellular structure. (See illustration.) By extending our observations, any part of the plant may be proved to be constructed of cells or their derivatives. In like manner, if the epidermis of an animal be magnified, it will be seen to be constructed of cell elements. (See illustration.) If animal tissue, for example, the liver, be hardened in alcohol and cut into thin sections, it may also be shown to be made of united cells. Now, cartilage presents us with a modification; in it the cells are separated by considerable lifeless substance in which the cells lie. (See illustration.) This lifeless substance has been secreted by the cells and thrown out around them. It may later have a deposit of earthy matter in it—as in bone—or may undergo other changes. These afford a few illustrations of cells in animals and plants. We must understand, however, that there is considerable variation, both as regards size and shape of the different cells, but they are quite uniform for the same kind of tissue.

This theory first took definite form in 1839–40 through publication of the observations of Schleiden and Schwann, and is generally known as the cell theory of



Cells from Epidermis of frog (upper left); Epidermis of leaf (upper right); Cartilage showing matrix (lower left); and liver (lower right).

Schleiden and Schwann. But cells, especially those of plants, had been observed long before this time. Robert Hooke, the English botanist, in 1665 described the plant-tissue in cork as made up of "little boxes or cells distinct from one another." Malpighi the Italian, Leeuwenhoek of the Netherlands and Grew of England all made sketches within a few years of this date, to show the cellular structure of plants. These, however, were individual observations, and Schleiden's great step consisted in applying the idea to all plants without exception; and Schwann made a general application to animal tissues. Both these men had a wrong idea regarding the cells. They thought of them as "box-like compartments," something like the cells in honeycomb or a wasp's nest, and, therefore, looked upon the cell-walls as important; but the idea of the cell changed and gradually came to mean the living particles instead of little boxes. Within the cavity of the cell is a jelly-like, viscid substance that is actually alive while the cell-walls are lifeless. The living substance is protoplasm, and in due time a cell came to be defined as a small mass of protoplasm containing a nucleus, for a nucleus or denser portion of protoplasm was found in all living cells. Finally, about 1860, the original idea of Schleiden and Schwann was completely replaced by the true one. Max Schultze did more than any other one man to establish this idea, which is called the protoplasm theory; but the work was greatly aided by De Bary the botanist and Virchow the pathologist.

In the meantime, a new discovery had been made and partly perfected, viz.: that the egg is a cell. It is a modified cell of the body of the parent, and, with this new fact in mind, we can account for the origin of cells in the body. The egg divides into 2, then into 4, 8, 16, 32 cells, and so on, so that what was a single cell becomes many, and each new cell is derived by division from a formerly living cell. The cells produced in this way become grouped into layers and, later, into tissues. As the tissues grow, the cells become changed, both in form and as regards the work they do, and so we have different kinds of tissue. Now, since all animals arise from eggs, the substance of the egg must contain everything that an animal inherits from its parents, and it follows that heredity, in the long run, is a question to work out on cells.

All activities have been shown, likewise, to take place in the protoplasm of cells; for example, the liver does not act as a whole, but each cell of which it is composed is doing a part of the work of the liver, and the combined action of all represents the work of that organ. This is the case with any other organ in the body, and, therefore, the cell is important in physiology as well as in anatomy and development. Many problems are to be solved by work on cells. The recent

observations on cells have become close and technical, and cannot be dealt with here. See Wilson: *The Cell in Development and Heredity* (1900); Hertwig: *The Cell* (1895); Sedgwick and Wilson: *General Biology* (1895). WM. A. LOCY.

**Cellini** (*chĕl-lē'nĕ*), **Benvenuto,** an Italian goldsmith, sculptor and engraver and the author of a very interesting account of his own life, was born at Florence in 1500. When young, he went to Rome, where his skill in metal-work gained him the favor of many nobles. He seems to have been somewhat of a freebooter, besides an expert swordsman and stabber, and had few scruples about murdering any one he chanced to quarrel with. His book mentions many of his encounters. He usually got off scot-free, but the murder of a rival goldsmith brough him to prison. He was, however, in such favor as a metal-worker as to be quickly set free again. He was summoned to the court of France and he tells us how pleased Francis I was with a golden spice-box he made for him. But it was in Florence that he produced his finest piece of sculpture, the famous bronze, *Perseus with the Head of Medusa.* He began to write his life in 1558, which is of the greatest interest. Cellini was a shrewd judge of men, and gives a faithful and wonderfully life-like picture of Italian society in the 16th century. He died in 1571.

**Celluloid** (*sĕl'ū-loid*), is a mixture of gun-cotton, camphor and various other substances. It is chiefly manufactured in the United States, most largely at Newark, N. J. Celluloid has many valuable properties. It is buff or pale brown in color, but it can be made as white as ivory or transparent. It can be molded or pressed into any form and turned, planed or carved. It is not affected by water or air. It can be hardened, and is then used for combs, piano keys and billiard balls. It can be colored to resemble amber or tortoise-shell. As an imitation of red coral, it is used in jewelry. Among the many articles made from it are knife-handles, buttons, napkin-rings, card-cases, thimbles, dolls, shirt fronts and collars.

**Cel'lulose** (*sĕl'ū-lōs*), the peculiar material which forms the original cell-walls of plants. See CELL.

**Celsius** (*sĕl'sĭ-ŭs*), **Anders,** a Swedish astronomer, born 1701, died 1744. Besides making some important geodetic measurements, he invented a scale of temperatures, known as the centigrade scale, which is now universally used in scientific work. The centigrade scale is defined by dividing the interval of temperature between melting ice and boiling water into 100 equal parts.

**Celts** or **Kelts,** an Aryan or Indo-European race that spread over Europe in early times. There seem to have been two migrations, the first Celts conquering and driving westward the native peoples, who were of the Ivernian race, and in turn being driven and conquered by the second horde of their countrymen. There was no common Celtic name by which all Celts were known to the Romans, but they were known as *Galli* or *Celtæ.* The Celts intermarried with the natives they conquered, and with the Romans and Saxons who conquered them; but some of them have remained more or less distinct, as the Irish, Bretons, Scotch Highlanders and Welsh. The language of the Irish and Scotch is called Gaelic; and a Gaelic dialect different from either of these, the Manx, is still spoken in the Isle of Man, while the Cornish dialect in the south of England, was spoken so late as a hundred and twenty-five years ago.

**Cement** (*sē-mĕnt'*), is any substance which without using mechanical rivets unites articles by solidifying from a soft or liquid condition. The most important cements are those which, when mixed with water, form a hard, stony mass. Mortar sets in open air, hydraulic cements under water. They are used with sand and broken stone in making concrete, for masonry exposed to water and for material in other situations that must possess exceptional durability. Stony cements may be natural, as lime and Roman cement, or artificial, as Portland cement. The latter was invented in England in 1824, is considered the strongest and best of the hydraulic cements, and is the chief cement considered in this article. In 1850 improved methods, with general recognition of cement's merit as a building material, ensured its commercial success. Then France and Germany took up the industry in earnest, and their scientific methods improved the processes and quality of the product. It arrived in America in 1865, began to be manufactured here in 1872, but did not number even 1,000,000 barrels a year until 1905. Its true value as a structural substance was undreamed of in 1882, and it has required a quarter-century for it to win universal use, but in 1911 79,547,958 barrels were produced and the future of cement in all construction, including artificial stone for house-building, appears assured.

Making Portland cement is a simple process. Rocks containing clay and lime are quarried, crushed and ground, and then burned in rotary kilns at 2,000° F. This cement-clinker, as the product is called, is cooled, crushed and reground to an impalpable powder. Then it is seasoned in dry bins, and finally about two per cent. of finely ground plaster-of-paris is added.

The vast use of cement is as concrete and reinforced concrete. Concrete is arti-

ficial stone made from broken granite, trap-rock or screened gravel (the sizes ranging from a walnut to an egg), clean coarse sand and cement. Sand fills the spaces between stones, cement those between grains of sand. The stone, gravel and (if strength be not indispensable) brick, cinders or terracotta form the aggregate, on whose character the concrete's final durability chiefly depends. Reinforced concrete is ordinary concrete in which iron or steel rods or bars are imbedded, and is needed if concrete is exposed to pulling or bending. In 1882 the employment of concrete was virtually confined to foundations and underground work, and reinforced concrete was undreamed of; but in 1885 the twisted bar was invented and the principle and method of reinforcing concrete demonstrated; and in 1906 buildings of reinforced concrete endured the California earthquakes practically unscathed. Now not only are huge warehouses, 800 feet long and nine stories high, built of concrete, but bridges, cellars, chimneys, cisterns, curbs, culverts, dams, drains, floors, hogpens, horseblocks, poultry-yards, porches, shingles, sidewalks, stalls, tanks and troughs.

Portland cement is the sole hydraulic cement that the builder of concrete blocks can seriously consider. Natural and slag cements and hydraulic lime, when exposed to dry air, are its inferiors in strength and durability. Moreover, the speed with which it hardens and develops its full strength would alone throw other cements out of consideration. The price of cement has, for years been lessening steadily, until now, at a fifth of a cent (wholesale) per pound, it is cheaper than stone in general, not seldom even cheaper than brick, while well-made construction cement equals the best stone. The combination of steel and concrete seems as nearly fireproof a composition as men may devise, and will, when generally employed, reduce insurance rates materially. In building on sandy soils, the stone or brick piers that are often built for considerable distance below surface as foundations are filled in with cement, and when this has hardened there practically is a huge single mass of stone. The buildings of the future are likely to consist almost entirely of steel and cement. When cement costs only five dollars a ton, the speediest means of building a house will be to make rough molds and cast the walls from solid cement. Then stone houses can be made for the cost of wooden ones. In view of the expensiveness of lumber already and the impending exhaustion of our forests, this fact is of incalculable importance. Edison is constructing iron molds and devising machinery to cast a full-sized house in twelve hours. At the end of six days the molds can be removed, and the house will be complete and, after drying six more days, be ready for occupancy.

Slag-cement also is coming into general use. Slag is a product of the blast furnace, resulting from the blending of iron ore and limestone. To the ironmaker it is so valueless that vast piles accumulate as waste. When it is suddenly cooled, dried and mixed with 25% of slaked lime, it forms a fine material for cement. Germany anticipated America in seeing the merit in slag-cement and in establishing factories for producing it. American manufacture of slag-cement began in 1902.

Pure white cement is now made. When mixed with white sand, white quartz and white marble or limestone, it produces pure white concrete. By the addition of small amounts of ordinary pigments to white cement, it yields concrete of brilliant, delicate and lasting colors.

**Cemetery** (*sĕm'ĕ-tĕr-ȳ*), (meaning a sleeping place), may mean any graveyard, but it has lately come to be applied to the large ornamental burial-grounds which have taken the place of the old custom of burying within and around churches. Western nations have got this idea from the Turks whose fine burial-grounds, especially around Constantinople, are famous and are dense forests of cypresses. A Mohammedan grave is never reopened, but after each death a cypress is planted. Paris was the first western city (in 1804) to set apart a modern cemetery, Pére la Chaise, which has become famous throughout Europe. The *Campo Santo* (Sacred Field) of Pisa, an oblong court surrounded by marble arches and adorned with noted frescoes and works of art and the *Campo Santo* of Genoa, with its wealth of sculpture, are both of them noted in Italy. There is an odd cemetery in Naples. In it are 366 deep pits, one of which is opened each day, and in it all the burials of the day take place, and it is not again opened until the same day in the following year. The park-like adornment of cemeteries has had most attention in the United States. The best known are Spring Grove at Cincinnati, Mt. Auburn near Boston, Greenwood in Brooklyn and Laurel Hill near Philadelphia.

**Cenci** (*chĕn'chē*), **Beatrice,** was the daughter of Francesco Cenci, a wealthy Roman nobleman. According to the popular story, the beauty of Beatrice awakened in him an evil love of his own daughter. The outraged girl, but 16 years old, in revenge planned with her stepmother and brother her father's murder, into whose brain two hired murderers drove a large nail. The crime was discovered, she and her brother were put to the torture, but, though the brother confessed, Beatrice maintained that she was innocent. All three, however, were beheaded. On

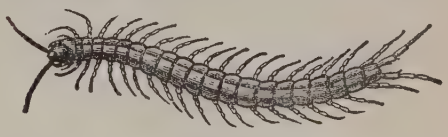
the story Shelley founded his tragedy of *The Cenci*. Researches have shown that Francesco was not so bad as he has been painted, that Beatrice was not so beautiful and virtuous as she has been pictured and, lastly, that the sweet and mournful face that forms one of the treasures of the Barberini Palace at Rome cannot, as was thought, be a portrait of Beatrice by Guido, who never painted in Rome until nine years after Beatrice was executed (1599).

**Cen'sus,** meaning the counting of the people. The word is a Latin one and was first applied to the duty of counting the people, which was intrusted to the Roman censors. Solon also established a census in Athens. The first careful census of a European nation was undertaken by Sweden in 1749. A count was made in France in 1700, but the first reliable one was not undertaken until 1801. In America the first census was taken in 1790; in England in 1801. Censuses are now taken in the United States, England, India, most of the British colonies, Austria, Belgium, Italy, Norway, Sweden, Russia and Switzerland every ten years; in France and Germany every five years; in Spain irregularly. Hardly any two countries agree as to the subjects on which information is asked. Thus, some inquire whether there are in households infirm persons, blind, deaf and dumb, idiots, insane persons, persons who have been convicted of a crime; how many languages are spoken by the persons entered; how many are at school, how many vote, how many rooms and windows are in the house, and so on. Without being too inquisitorial, the design of the census-returns should at least afford information not only as to the vital statistics of a country or nation but as to its industrial and economic resources, including the extent and character of its chief industries, manufactures, mines, if any, and the growth and nature of its agricultural products. The United States census is the most important of any, as the representation of the states in the lower house depends upon it. It was provided for in the constitution. It aims at giving a specially full view of the condition of the people, and is illustrated with maps on almost all the many branches of inquiry, such as the amount of land occupied by different crops and where various diseases prevail, as well as the indicated scope, extent and nature of its manufacturing interests, its mining resources, etc. The thirteenth (1910) census gives the United States a total population, including Alaska and the territories, of 93,402,151. The census of 1900, embraced in a series of ten volumes, devotes two to population, two to other vital statistics, two to manufactures. The census-bureau, organized as a permanent one in 1902, is under the Department of Commerce and Labor, and its periodic bulletins are of the utmost value.

**Centaurs** (*sĕn'tąrs*) (meaning bull-killers), a wild race of men, who lived in early times in the forests of Thessaly and spent their time in bull-hunting. Homer first tells about them, picturing them as savage, gigantic in stature and covered with hair. It was not until the time of the poet Pindar that they are spoken of as half-man and half-horse. In Greek myths these horse-centaurs are described as fighting with a people called the Lapithæ and with Hercules. The most famous was Chiron, who was the teacher of Achilles. When the Mexicans, who had never seen horses, first set eyes on the Spaniards on horseback, they believed that the horse and man together made one animal, or a centaur, as the Greeks would call it.

**Centigrade Scale.** See CELSIUS.

**Centiped** (*sĕn'tĭ-pĕd*), the common hundred-legged worm of warm regions. The body is divided into a number of similar joints, and each joint is provided with a pair of legs, of which there are from 21 to 23. The enlarged front joint is the head, with eyes, jaws and long many-jointed feelers. Although resembling worms in form, they are really more closely related



CENTIPED

to insects. They resemble the larval stages of the latter in external and internal structure, having jointed appendages, antennæ or feelers, and breathing by air-tubes. These traits are not possessed by worms, but by insects, spiders, etc. The centipeds proper represent one group (*Scolopendra*) of a larger subclass called *Myriopoda*. The largest centipeds, from nine inches to one foot long, live in the East Indies, but one in South America attains nearly equal size. Their fore feet are modified into poison-claws, and their bite is fatal to small animals and dangerous to man. The centipeds are to be distinguished from the millepeds which are common in the United States and Europe, but a few centipeds are found within the borders of the southern states, the largest of which is five and one-half inches long. The centipeds live on insects and small animals, the millepeds mainly on decaying wood. The latter are harmless.

**Central Africa Protectorate, The,** contains 40,980 square miles, with a population of 750 Europeans and nearly a million natives. The chief settlement is Blantyre, in the Shiré Highlands, with about

6,000 inhabitants. It lies along the southern and western shores of Lake Nyasa, extending toward the Zambezi. There are good roads everywhere, and life and property are safe, with the inhabitants prosperous and content. The prevailing religion is Mohammedanism, with nine Christian missions at work having 61,000 natives under instruction. Tobacco, coffee, cotton, rice can all be cultivated in either the lowlands or highlands. The trading is chiefly done at Port Herald and Chiromo on the lower Shiré and at Kotakota on Lake Nyasa. Imports are largely cloths, ironware and food; exports include coffee, cotton, tobacco, beeswax and rubber. For purposes of administration the protectorate is divided into 12 districts, and there is a small force of Sikhs and natives under British officers. Twenty post-offices in 1903 handled 391,599 pieces. There are railway, telegraph and telephone lines, and a water-power electric light plant at Zomba. In 1906 it was made the Nyasaland Protectorate.

**Central America.** See AMERICA.

**Central Falls, R. I.,** a manufacturing city in Rhode Island, on the New York, New Haven & Hartford Railroad, six miles from Providence. It is situated in Providence County and was taken from the town of Lincoln, and incorporated as a city in 1895. It has a number of factories, foundries, extensive cotton, woolen, thread and silk-mills, haircloth manufactories, foundries and machine-shops. Population 22,754.

**Cen'tral Park,** the great park of New York city and one of the largest and finest in the world, was laid out in 1858. It lies in what is now the heart of the city, two and a half miles long and one half-mile wide, inclosing 843 acres, with an addition of 24 acres on the northwest. A part of it is used for two Croton water-reservoirs. The surface at first was all rock and marsh, and the expense necessary to level and fill in forbade its being made into city lots. Making it into a huge park was a happy idea; the marshes have become lakes, some of the bare rocks are now grassy slopes, while the massive bowlders and tall rock-walls face one at every turn of the winding path or smooth driveway. There is thus the wild appearance of mountain and forest, the contrast being heightened by the solid rows of brownstone city-fronts that line the bordering avenues, far surpassing the effects usually produced in small city parks, where everything is so evidently artificial. The Metropolitan Museum of Art and the American Museum of Natural History occupy two large and handsome buildings in the park. Some of the points of interest are the obelisk, casino, mall, lake, cave, labyrinth and menagerie.

**Centra'lia, Ill.,** a city in Marion County on the Ill. Central, Chicago, Burlington & Quincy, the Southern and the Ill. Southern railroads, 60 miles east by south of St. Louis. Settled in 1852, the city was incorporated seven years later, and is now governed by a charter passed in 1872 and subsequently amended. It is situated in a fine fruit-growing region, where there is also much coal-mining. Besides the car and repair shops of the Ill. Central Railway, its industries embrace the manufacture of envelopes, boxes, pick-handles, crates, besides glassware and the product of its flour-mills. Population, 15,000.

**Centrif'ugal Force** is due to rotation. If a particle is in motion along any path other than a straight line, it is acted upon by a force which is directed toward the convex side of the curve. This is called a centrifugal force. In particular, if a particle of mass $m$ be moving in a circle of radius $r$ with a uniform speed $v$, the centrifugal force is at each instant directed along the radius passing through the particle, and the amount of the force is $\frac{mv^2}{r}$. Centripetal force is merely the negative aspect of centrifugal force. If we consider Newton's Third Law and call centrifugal force action, then centripetal force is merely the reaction, which is equal and opposite to the action.

**Century Plant.** See AGAVE.

**Ceramics** (*sē-răm'iks* or *kē-ram'iks*), a name given to the plastic and decorative arts, which covers such objects of baked clay as are included in earthenware and porcelain, ornamentally treated in colors, glazing and firing. The term is applied to include such artistic utensils and decorated wares, known to experts as Majolica and Japan ware, the famous faience of Limoges, the porcelains of Worcester, Doulton and Sévres, Balleek china, plaques, pigs, vases, punch-bowls, candelabra, etc., artistically modeled, painted, glazed and enameled. The term, it will be seen, is a comprehensive one, and is applied to such objects of ornamental earthenware and porcelain as come under the category of fictile art.

**Cerberus** (*sĕr'bĕ-rŭs*), the fabulous watch-dog who guarded the entrance to the lower world or Hades, is generally described as a monster having three heads. The twelfth and final labor of Hercules was to drag forth Cerberus to the light of the upper world, and that without use of a weapon. Orpheus, lacking the strength of Hercules, is said to have lulled Cerberus to sleep with his lyre on his journey to Hades for the lost Eurydice. Milton speaks of Melancholy as "of Cerberus and blackest midnight born" (*L'Allegro*).

**Ceres** (*sē'rēz*), the Roman goddess who protects agriculture and the fruits of the

earth. Her first temple in Rome was built in 496 B. C. to ward off a famine with which the city was threatened. A great festival with games, called *Cerealia*, was set up in her honor.

**Cerro Gordo** (*sĕr'rô gôr'dô*), a mountain-pass in Mexico, on the main highway to the City of Mexico. Here was fought a battle between the Americans and Mexicans, April 18, 1847. General Scott's force was 8,500, and Santa Anna's over 12,000. The engagement lasted from sunrise until 2 P. M., the Americans conquering with a loss of but 431 killed and wounded. The Mexican loss was from 1,000 to 1,200, with 3,000 prisoners, including five generals. Stores and artillery were surrendered.

**Cervantes Saavedra** (*ser-văn'tēz sä-ä-vä-drä*), **Miguel de,** the author of *Don Quixote*, was born in 1547, of an old and noble Castilian family. In 1569 we find some effusions of his on the death of the queen, that show he had begun to be a writer; but the next year we find him in Italy enlisted as a soldier and receiving three gunshot wounds at the battle of Lepanto. Coming home to Spain, he was captured by pirates, carried to Algiers and enslaved for five years. He made four daring attempts to free himself and his companions, but only regained his liberty by his family beggaring themselves to raise the large ransom demanded. He now began to write plays, which were not very successful and are all forgotten, except *Numancia*, which is acknowledged to be the most powerful tragedy in the Spanish language. In 1605 he brought out the first part of his great book, *Don Quixote*. It at once gained the greatest popularity, and the next year, in all the pageants throughout the country, men dressed to represent Don Quixote and his faithful Sancho Panza paraded the streets. Strange to say, Cervantes himself never thought it a great book; certainly no great book was ever written so carelessly. He worked at it by fits and starts, sending it to the printers without revising it and then laughing at their and his own blunders. Nor did he take the trouble to bring out the second part for ten years, though all this time he was a busy writer; and only at last published it because somebody else had written a false second part. Cervantes, who knew what real bravery was, wrote *Don Quixote* to make fun of the mock bravery that strutted about in the guise of chivalry; but he also, before the book was finished, took the liberty of laughing at a great many other foolish things. Cervantes died at Madrid, April 23, 1616.

**Cervera** (*thâr-vâ'rä*), **Pascual,** a Spanish admiral who figured prominently at the outbreak of the Spanish-American War, was born at Madrid, in 1832, of a family of naval heroes. Early in his career he saw service in Morocco, in Cochin-China, in the Philippines and in the Spanish blockade of Cuba in 1870. He was, for a time, a naval attaché of Spain at Washington, and subsequently rose to the rank of rear-admiral. When war broke out with Spain, Cervera, with an inefficient squadron was ordered by his government to Cuban waters, and in May, 1898, was blockaded in Santiago harbor by a United States fleet. Realizing that he could make no effective defense, he determined to run the blockade, but was overtaken and his ships were destroyed. His flagship, the *Maria Teresa*, took fire in the contest and had to be beached. Cervera, escaping on a life-raft, was rescued and taken on board the *Gloucester*, where he surrendered and was held a prisoner of war until the peace protocol was signed, in August, 1898. He died in 1909.

**Cetewayo** (*kä-chwä'yô*), a noted Kafir chief, king of the Zulus, who in 1878 rebelled against British suzerainty, and in the following year annihilated a British regiment at Isandula, South Africa. Later in the same year Cetewayo was defeated by the British under Lord Chelmsford at the battle of Ulundi, taken prisoner and held captive till 1882. In that year he was brought to England, and there lionized by the Liberals, who were in favor of local autonomy in South Africa. The attempt was afterward made to reinstate him as king of Zululand; but having lost favor with his people, he was kept by the British at Ekove until 1884, when he died.

**Ceylon** (*sê-lŏn'*), an island and British colony in the Indian Ocean, southeast of India. Its greatest length is 266 miles; its greatest width 140 miles; area, 25,332 square miles. The sea of sapphire-blue beating against tall rocks and the rich evergreen forests towering above, till they are lost in the clouds, make a picture that can vie with any scenery in the world.

*Surface and Drainage.* Rolling plains cover the most of the island, and in the south mountains rise 8,000 feet in height. There are but one important river and two natural harbors; but the breakwater, which has been built at the capital, Colombo, has brought the bulk of commerce thither.

*Plants and Animals.* Most of the great tropical plants and trees are found here, noticeably tree-ferns often 25 feet high, scarlet flowering rhododendrons and tufted bamboos. The largest animal is the elephant, usually without tusks. Of the natives, the most numerous are the Singhalese, who are believed to be colonists from the valley of the Ganges.

*Products and Resources.* The great exports are tea, coffee and cinchona bark. The gems of Ceylon are well known. Here are found sapphires, rubies, topazes, garnets and amethysts, while the pearl-fisheries form a great British monopoly.

*People and Religion.* The men look very womanish, with their delicate features, their

earrings, their long hair brushed back from the forehead and held by combs and their waist-cloths like petticoats. The Singhalese are Buddhists and do homage to the footstep of Buddha on the top of Adam's Peak, while his tooth is carefully kept in a rich shrine. Good work is being done in Ceylon by Christian missions and schools.

*History.* In the north of the island ruined cities have been discovered, bringing to light rock-hewn temples, cave temples, relic shrines which almost compare with the pyramids of Egypt and gigantic water-tanks on which an immense amount of labor must have been bestowed. The Portuguese settled on the island in 1517, but were driven out by the Dutch in 1658, who were in turn conquered by the British in 1796. The chief town is Colombo (population, 158,228). Population, chiefly Singhalese and Tamils, 3,592,397.

**Chad, Lake.** See TSAD, LAKE.

**Chadbourne** (*chăd'bûrn*), **Paul Ansel,** an American educator, was born at North Berwick, Me., Oct. 21, 1823, and died at New York, Feb. 23, 1883. In 1848 he graduated at Williams College, where he was subsequently professor of chemistry and botany, and conducted some scientific expeditions with its students in Florida, Newfoundland, Iceland and Greenland. In 1867 he became first president of the State Agricultural College at Amherst, Mass., and, though he left this post to assume other duties, he returned here in 1882 and spent his last years in its work. In the interval he was successively president of Wisconsin University and of Williams College, of the latter of which he was an LL.D. He was also a licentiate in the ministry, and held the degree of D D. from Amherst. He published a number of works, chiefly consisting of courses of lectures before the Lowell institute and the Smithsonian institution and of baccalaureate sermons and addresses. These include *Natural Theology*; *Instinct in Animals and Men; Relations of Natural History to Intellect, Taste, Wealth and Religion; The Strength of Men and the Stability of Nations*, etc.

**Chaffee, Major-General Adna Romanza,** United States army, in command of the American military contingent in China that acted with the Japanese and European troops in the advance (August, 1900) on Pekin, for the relief of the besieged legations at the capital. Born April 14, 1842, at Orwell, Ohio, he entered the army in 1861; became lieutenant in 1865 of the Sixth cavalry, major of Ninth cavalry in 1888 and lieutenant-colonel of Third cavalry in 1897. He gained a lieutenancy for gallantry at Gettysburg and a captaincy for gallantry at Dinwiddie Court-House, Va. He was made major and subsequently lieutenant-colonel for gallantry against the Indians in Texas and Arizona; appointed brigadier-general in 1898 of United States volunteers; and served in the Santiago campaign and was made major-general of volunteers in July of the same year. In 1900, at the outbreak of the Boxer riots in China, he was appointed to command the United States troops acting with the European allies in the advance from Tien-tsin to Pekin. In 1901 he was made major-general in the United States army, and placed in command of the forces in the Philippines, of which he was appointed military governor. In 1904 he was promoted to lieutenant-general and appointed chief-of-staff. He was retired from the army in February, 1906. He died November 1, 1914.

**Chagos** (*chă'gŏs*) **Islands.** These are largely islets and dependencies of Mauritius. The largest of them, Diego Garcia, lies in 7° south latitude and between 72° and 73° east longitude, and is 12½ miles long and 6½ broad, with 526 inhabitants.

**Chaillu, Paul du.** See DU CHAILLU.

**Chalazogamy** (*kăl'a-zŏg'a-mĭ*), in plants. In ordinary angiosperms the pollen tube, having passed through the style, enters the micropyle of the ovule and so reaches the egg. In certain dicotyledons, as walnut, birch, alder, etc., it has been found that the pollen-tube does not enter the micropyle, the natural passageway to the egg, but penetrates directly through the external parts of the ovule and burrows its way to the egg from the side or from beneath. The name has been given from the fact that the basal region of the ovule is known as the chalaza, which is at the opposite end of the ovule from the micropyle. The habit is a curious one, and its significance is not clear.

**Chalcedony** (*kăl-sĕd'ŏ-nĭ*), a beautiful mineral. It is a variety of quartz, with a mixture of opal. It was found abundantly near Chalcedon, in Bithynia, which gave it its name. It is found lining or wholly filling cavities in old rocks, like the basalt rock of Scotland, Iceland, etc. Chalcedony composes the whole or main part of many agates. It is generally translucent, has a waxy luster and is usually white or bluish white; sometimes reddish or milk white; more rarely gray, blue, green, yellow, brown or black. Chalcedony is much used in jewelry for brooches, necklaces and ornaments of all sorts; and large pieces are often made into little boxes, cups, etc. The people of olden times prized it highly, and many beautiful engraved specimens can be seen in museums. Petrified plants are sometimes found in chalcedony, in which they seem to have been incased while it was forming. Sometimes a specimen with a little water inside is discovered.

**Chaldæa.** See BABYLONIA.

**Chaleurs** (*shă-lĕr'*), **Bay of,** extends westward in between the provinces of Quebec and New Brunswick. It forms more than half of the northern boundary of New Bruns-

wick. Said to have neither shoal or reef. Its fisheries (salmon, cod, herring, mackerel and lobster) are very important.

**Chalk.** Chalk is a variety of soft limestone, made up chiefly of the shells of microscopic sea-animals, called *Foraminifera*, which in life swim at or near the surface of the water. After the death of the animals their shells sink to the bottom. A cubic inch of chalk has been estimated to contain more than 1,000,000 shells. With the shells of the *Foraminifera* shells of other animals are sometimes mingled. In certain periods of the past these minute shells have accumulated in such numbers as to make beds scores of feet in thickness over great areas of the sea-bottom. Some portions of the sea-bottom on which these chalk-beds accumulated have subsequently been converted into land by uplift, so that chalk-formations now occur on the continents. Oozes similar to chalk are now accumulating on some parts of the ocean-bed. Contrary to the earlier belief, the chalk-formations known on the land were made in shallow, not in deep, water. The chalk of our country is found principally in the western plains, from Texas to Nebraska. In foreign countries it is found especially in France and England. Most of the known chalk was formed in the Cretaceous period (see GEOLOGY). In color it is usually white or whitish, and in composition it is chiefly carbonate of lime. Chalk is used extensively in the arts and to a slight extent in medicine. Various other substances, such as red chalk, yellow chalk, black chalk, French chalk, etc., which are soft and will make a mark, as on a blackboard, are erroneously called chalk.

**Chalmers** (*chăl'mẽrz*), **Thomas,** a Scottish divine, was born in Fife, Scotland, March 17, 1780. He was graduated at St. Andrews University, and began to preach when but 19 years old. What made him the earnest Christian leader he became was the careful study he made of Christ's divinity, when asked to write an article on the subject for an encyclopædia. Then his great genius broke forth like the sunshine. Called to the Tron church, Glasgow, his oratory took the city by storm; visiting London, his preaching soon made him as well-known as at home. To wrestle with the ignorance and vice of Glasgow, he became minister of St. John's parish, with its 2,000 families of work-people. Here he set up day-schools and 40 or 50 Sunday-schools. The authorities left him the whole management of the poor in his parish, and in four years he reduced the amount expended on paupers from $7,000 to $1,120. This work ruined his health, and he left it to take a professorship in St. Andrews and, afterward, in Edinburgh. He was very strongly on the questions that then divided the Scottish church, and, followed by 470 clergymen, he led a secession movement and founded what is known as the Free Church of Scotland. All his life he was a busy writer. His works extend to 34 volumes, mostly on theological, Christian and social subjects. As a pulpit orator he was unrivaled. Gentle, guileless and genial-hearted, he combined great brain-power and imagination with the shrewdest common sense. He died on May 31, 1847.

**Cham'berlain, Rt. Hon. Joseph,** an English statesman and M.P., for Birmingham West, was born in London, in July 1836, and educated at University College. He began his political career as an advanced Radical, was thrice elected mayor of Birmingham and was in 1876 returned to Parliament for that city, and represented it until the year 1885. In early life he was an active member of the firm of Messrs. Nettlefold & Co., screw manufacturers of Birmingham. In 1880 he became president of the board of trade in Mr. Gladstone's cabinet, and came into prominence as an able politician and forceful debater. Taking issue with his political chief on the subject of Irish home-rule, he in 1886 allied himself with the Conservatives. Though at first disliked by the latter, he afterward became their leader in the house of commons, where he was regarded as a fierce fighter and hard hitter as well as a man of great force and ability. He took office in the Tory ministry of Lord Salisbury as colonial secretary, and did much to promote colonial enthusiasm for the war with the Boers in South Africa, to bring about Australian federation and in his masterful way in Parliament to defend the Tory government for the mistakes and shortcomings in the Boer War. He was an earnest advocate of municipal reform and of the betterment of the condition of the working classes. He was lord-rector of Glasgow University. In 1888 he married, as his third wife, Mary, daughter of W. C. Endicott, formerly United States secretary of war. Age and ill-health withdrew him from many of his activities. He died July 2, 1914.

JOSEPH CHAMBERLAIN

**Chambers** (*chām'bẽrz*), **William,** was born on April 16, 1800, at Peebles, Scotland. The boy's schooling ceased in his thirteenth year, owing to his father's business troubles. After a five years' apprenticeship to an Edinburgh bookseller, he started in business

for himself, soon adding printing to bookselling. In 1832 he founded *Chambers' Edinburgh Journal*, the pioneer of a class of cheap and popular periodicals of a wholesome kind, now so general. Together with his brother Robert, he wrote and published many useful books, especially the *Cyclopædia of English Literature* and *Chambers' Encyclopædia* in ten volumes. He died on May 20, 1883.

**Cham'bersburg, Pa.,** a borough, the seat of Franklin County, on Conococheague Creek and on the Western Maryland, and the Cumberland Valley railroads, about 50 miles southwest of Harrisburg and 150 west of Philadelphia. It is an attractive town, with many fine buildings, including churches and schools, besides Wilson (Presb.) College for women; and in the neighborhood are Mont Alto, Wolf Lake and Pen-Mar Parks. The city owns and operates its electric-light plant and waterworks, and in addition to the Cumberland Valley Railway car and machine-shops, has manufactures of paper, iron, engines, boilers and milling machinery; also establishments for the manufacture of shoes, furniture, gloves, hosiery, woolen goods and flour. Population 13,500.

**Chambord** (*shän'bôr'*), **Henri Charles, Comte de,** and Duc de Bordeaux, claimant to the French throne as the last representative of the elder branch of the French Bourbon dynasty, was born at Paris, Sept. 29, 1820, and died near Vienna, Aug. 24, 1883. He was the son of the Duc de Berri, and in 1836 married the Princess of Modena, but left no children In 1830 his grandfather, Charles X, abdicated in the Count of Chambord's favor, when he assumed the title of Henri V; but his claim was unrecognized by France, and Louis Philippe came to the throne, while the Count had to go into exile.

**Chameleon,** a lizard of Africa and Madagascar, with the power of changing its color to correspond with that of surrounding objects. The name properly belongs to the Old World form, though it is now commonly applied to certain small lizards of the southern United States, which have the same power of quickly changing color, though this is not confined to the chameleons. Nearly all lizards have it to a greater or less degree, but it is highly perfected in the chameleon. Even a passing cloud is said to affect the particular shade of its color. The true chameleon of Africa is covered with granular scales and has a rigid head but very movable eyes. The long tongue is worm-like, with a knob on the end, and is run out with remarkable quickness to catch insects. The tail is clinging. It is also capable of puffing out the neck with air. The American chameleon belongs to a different family. It is a smaller animal, covered with minute scales, and very abundant in the southern United States and the island of Jamaica. Its body is about three to three and one half inches long, and the tail alone is about six inches. It is white below, but above can change rapidly to shades from emerald

CHAMELEON

green to dark bronze. It assumes most perfectly the green color, and, on the leaves of palmettoes, can scarcely be seen if looked at from above, but, by looking from underneath, the dark shadow of the animal shows its position. It sleeps during the night and is most active in the daytime, when insects are moving. The cat is its natural enemy, and will leave all other kinds of food, even fish, for the chameleon. Various explanations have been suggested to account for its ability to change color. The outermost layer of skin is transparent, and underneath are two colored layers—the upper layer lighter and the deeper one darker. Both of these can be changed in intensity by contraction or expansion of the coloring substance. This is probably effected through the nervous system.

**Chamois,** (*shăm'mȳ* or *shà-moi'*), a small mountain antelope inhabiting the European Alps from the Pyrenees to the Caucasus. It is about 3 feet long and 2½ feet high at the shoulders. It may be known by the horns, which are carried by both sexes. They are from six to eight inches long, black, slender and round; they rise almost vertically from the forehead, and at the extremities suddenly hook backward and downward. The body is covered with coarse reddish-brown hair, paler on the head, with a dark-brown streak on each side. The hair becomes lighter in the spring. Underneath the hair is a short, thick, grayish wool. The tail is short and black. They are shy and live in herds, always posting a sentinel when feeding. The signal of danger is a whistling sound, accompanied by stamping of the fore feet. Chamois-hunting in Switzerland used to be a favorite but dangerous amusement. The hunter followed the animals into almost inaccessible places and sometimes bared the feet and scratched them enough to cause slight bleeding, in order to prevent slipping on the smooth rocks. Chamois were once common in the Swiss Alps, but

are now greatly reduced in numbers. In the Austrian mountains, where they have been better preserved, it is not uncommon to see bands of 20 or 30 individuals. The agility and climbing powers of the

CHAMOIS

chamois are famous; its foot is especially well formed for laying hold of slight projections on the rocks. The outer margin of the solid hoof is lower than the sole, forming a shallow depression. In summer chamois ascend to the limits of the snow-line; in winter they descend to the wooded districts that border the glaciers. They do not hesitate to spring over chasms nor to leap downward 20 or 30 feet against the rocky face of an apparently perpendicular precipice. The fine soft leather known as *Shammy* was originally made from chamois-skin, though many of the skins now sold under that name are manufactured from sheep-skin. The flesh is prized as food, and resembles venison in flavor.

**Chamouni** (*shă'mō'nē'*), a celebrated valley among the French Alps, is about 3,400 feet above the level of the sea. It is about 13 miles long and two broad. On the south is the giant group of Mont Blanc, from which great glaciers glide down, even in summer, almost to the bottom of the valley. The chief of these is the *Glacier des Bois*, which in its upper course expands into a large mountain lake of ice, called the *Mer de Glace*. Over 15,000 tourists visit the valley every year, and from this point Mont Blanc is usually ascended. The beauties of Chamouni have been written of by Byron, Coleridge, Shelley, Wordsworth, Lamartine and Ruskin.

**Champagne and The American Wine Industry.** Great strides have of recent years been made in the production and improved quality of the wines of the United States, with the gratifying result that they have largely supplanted the importation and use of the product of the foreign-grown grape. The total yield of the native wine has now risen to close upon forty million gallons per year. The region of its chief cultivation is still California; though production has of late largely risen in the states of New York and Ohio as well as in several of the western and southern states. The superior quality of the native wine has now become a matter of national and local felicitation, which is evidenced by the fact that it is increasingly rivalling the imported vintages of the Old World. Of sparkling wines there has been a great increase in Californian production, especially in the last 10 or 12 years, both the soil and the climate of the state, over a large area, favoring the vineyard yield and that to well-nigh perfection. There the manufacture of champagne is now a great and remunerative industry, while it is increasingly satisfactory to the taste of wine connoisseurs. At Urbana and Rheims, N. Y., as well as at Brockton and Ripley in the same state, and at Erie, Pa., Sandusky and Toledo, O. and on Lake Erie Island there are also successful winemaking establishments, their collective output annually being large and constantly increasing in yield and in improved brands.

**Champaign** (*shăm-pān'*), a city in Champaign County, Ill., 128 miles south of Chicago. It has the service of the Illinois Central, the "Big Four" and several other railroads. It is situated in a rich agricultural region, and has foundries, machine-shops and a number of manufacturing interests. Located here is the Burnham Athenæum and Hospital. The cities of Urbana and Champaign join, and they have electric service. The University of Illinois is located between Champaign and Urbana. Population, 15,823.

**Champ-de-Mars** (*shon'de-märz'*), a large square on the outskirts of Paris, where military reviews are held. The first great feast of the Revolution was held here on July 14, 1790. At that time the place was not ready, and all Paris, men and women, turned out and worked night and day to put it in readiness. It has been used for fairs, feasts, great mass meetings and demonstrations of mobs.

**Champlain** (*shăm-plān'*), a beautiful lake separating the states of New York and Vermont. It is 110 miles long and from one to 15 broad. It empties into the St. Lawrence through the Richelieu River, and a canal joins it to the Hudson. Here the Americans defeated the British in a naval battle in 1814. The lake is named from its discoverer, Samuel de Champlain.

**Champlain, Samuel de** (1567-1635). Of the most striking figure, perhaps, in Canadian history during the French régime, Sir John Bourinot says: "It was not in Acadia but in the valley of the St. Lawrence that France made her great effort to establish her dominions in North America. Samuel Champlain, the most famous man in the history

of French Canada, laid the foundation of the present City of Quebec in the month of June, 1608, or three years after the removal of the little Acadian colony from St. Croix Island to the Basin of the Annapolis. For 27 years Champlain struggled against accumulating difficulties to establish a colony on the St. Lawrence. He won the confidence of the Algonquin and Huron tribes of Canada who then lived on the St. Lawrence and Ottawa Rivers and in the vicinity of Georgian Bay. He recognized the necessity of an alliance with the Canadian Indians who controlled all the principal avenues to the great fur-bearing regions . . . It was during Champlain's administration of affairs that the Company of the Hundred Associates was formed under the auspices of Cardinal Richelieu, with the express object of colonizing Canada and developing the fur-trade and other commercial enterprises on as large a scale as possible. The company had ill-fortune at the outset . . . When Champlain died on Christmas Day, 1635, the French population of Canada did not exceed 150 souls, all dependent on the fur-trade. Canada so far showed none of the elements of prosperity; it was not a colony of settlers but of fur-traders. Still, Champlain by his indomitable will, gave to France a footing in America which she was to retain for a century and a quarter after his death. He stands foremost amongst the pioneers of European civilization in America."

Dr. Dawson, in his volume on the St. Lawrence Basin, gives the following interesting sketch of Champlain: "Champlain was a many-sided man, strong in body as in mind. He was as much at home in the brilliant court of France as in a wigwam on a Canadian lake, as patient and politic with a wild band of savages on Lake Huron as with a crowd of grasping traders in St. Malo or Dieppe. Always calm, always unselfish, always depending on God, in whom he believed and trusted, and thinking of France which he loved, this simple-hearted man resolutely followed the path of his duty under all circumstances; never looking for ease or asking for profit, loved by the wild people of the forest, respected by the courtiers of the king and trusted by the close-fisted merchants of the maritime cities of France."

**Champs-Elysees** (*shon'zā-lē-zā'*) (meaning elysian fields), celebrated gardens and an avenue-promenade in Paris, between the Place de la Concorde and the Arc de Triomphe. It came into the possession of the city in 1828, and is extensively used as a public resort.

**Chan'cellorsville,** a village in Virginia, south of the Rappahannock River, where a series of battles were fought May 2-4, 1863, between the Army of the Potomac under General Hooker and the Confederate army under General Lee. The Union army, though superior in numbers, after three days' terrible fighting was defeated and retreated across the Rappahannock, with a loss of 18,000 men. The Confederate loss was 13,000, including the brave and able Stonewall Jackson, who was accidentally shot by his own men and died eight days later.

**Chandler, Zachariah,** United States senator from Michigan (1857-75 and again in 1879) and secretary of the interior (1875-77), was born at Bedford, N. H., Dec. 10, 1813, and died suddenly at Chicago, Ill., Nov. 1, 1879. He was for a time in the dry-goods business in Detroit, Michigan, where as an active anti-slavery Whig, he took interest in the "underground railroad," by which slaves found their way to freedom in Canada. In 1857 he was elected to the United States senate, and continued a member of that body till his death, with the intermission of the years 1875 to 1879. In 1875 he was secretary of the interior in the Grant administration. During the Civil War he was loyal to the Union, and rigidly defended it against the slave-states. He also opposed, for the time, the admission of Kansas.

**Chang-Choo-Fou,** a large city of China, in the province of Fokien, 35 miles from Amoy, its port on the coast. It is well built, and has a large Buddhist temple. Population, estimated at 1,000,000.

**Channel, The English,** is the narrow sea between England and France. It joins the North Sea at the Strait of Dover, where it is only 21 miles wide. From here to its junction with the Atlantic, where it is 100 miles wide, its length is 280 miles It contains the Channel Islands, the Isle of Wight and others.

**Channel Islands,** a group of small islands off the coast of France, subject to Great Britain. Jersey, Alderney, Sark and Guernsey are the largest. The whole group covers 75 square miles, with a population of 95,618. The islands contain much fine scenery. They belonged to Normandy when William the Conqueror invaded England, and have belonged to England ever since. The people still speak Norman-French; while modern French is the official language used in courts and the legislature. Politically, the islands are administered by their own laws and customs, each by a lieutenant-governor with judicial and other functionaries, and a states' assembly, partly elective. Jersey has a separate legal existence. Guernsey, Alderney and Sark have a lieutenant-governor in common, but otherwise their governments are separate. In these respects, the islands may well be called the Land of Home-Rule. The islanders are mainly farmers, and fertilize their lands with the rich seaweed gathered on the coasts. The

fine breeds of Alderney and Jersey cattle come from here.

**Chan'ning, William Ellery,** a great American preacher and writer, was born on April 7, 1780, at Newport, Rhode Island. He graduated from Harvard in 1798, and preached first as pastor of a Congregational church in Boston. Here his sermons soon became famous for their fervor, solemnity and beauty. He gradually drifted toward the Unitarian creed. His interest was not confined to religion alone, for he advocated temperance and education and was opposed to war and slavery. He stands high also as an essayist. Among his most popular essays are those on *National Literature, John Milton, Fénelon* and *Self-Culture.* He died at Bennington, Vermont, Oct. 2, 1842.

**Chantilly** (*shăn-tê-yĕ'*), a town in France, in the department of the Oise, 25 miles north-northeast of Paris, noted for its fine lace-manufactures. The famous races of the French Jockey Club are held here. Here was the magnificent palace of the great Condé, which was destroyed during the Revolution. The Duc d'Aumale, in 1850, built a fine castle here, which, with its domains about it, he presented in 1887 to the French Institute. Population, 4,500.

**Chapleau, Hon. Joseph Adolphe,** was born in Terrebonne (Quebec), in 1840. He was called to the bar in 1861, and was created an officer of the Legion of Honor (France) in 1882. A professor, in Laval University, of Criminal Jurisprudence. He was solicitor-general under Mr. Ouimet in 1873, was appointed provincial secretary, 1876, and in 1879 was premier of Quebec. Appointed Secretary of State in Canada in 1882. He was elected to the parliament of Canada in 1867, 1871 and 1875, and was elected for Terrebonne in the House of Commons in 1882. He was a very prominent and influential French Canadian for at least a quarter of a century. His death occurred in 1889.

**Chapultepec** (*chà-pōōl'tà-pĕk'*), a Mexican fortress, built on a rock 150 feet high, about two miles from the city of Mexico. On Sept. 8, 1847, General Scott first stormed Molino del Rey, an old powder-mill in rear of the fortress and then, September 12, brought four batteries to bear on Chapultepec from the opposite ridge. After cannonading a day and a half, attacks on the two sides were made at the same time, which carried the castle, with slight loss to the Americans. This victory threw open the causeway leading to the city, and, the day after, United States troops occupied the Mexican capital. To-day Chapultepec is occupied as the summer residence of the president of Mexico, General Diaz; it is the seat also of an observatory and a military school.

**Characeæ** (*kà-rā'sê-ē*). A group of aquatic plants, commonly called stoneworts and usually included among the green algæ (*chlorophyceæ*). They have no other coloring matter than chlorophyll, but they are so different from the other green algæ that it is doubtful whether they should be included with them. They are more complex than the other algæ, growing in fresh or brackish waters and being fixed to the bottom. They often form great masses, even choking up shallow ponds. They are coarse, thready and branching growths, whose walls become incrusted with a deposit of lime, which makes them harsh and brittle and suggests the common name, stoneworts.

**Char'coal.** Animal charcoal is made from bones by heating in a closed vessel or retort, when the gases, water-vapor and oil are given off, and bone-black, mainly carbon, remains. It is seen usually in coarse grains, from the size of peas to pin-heads, and is used mostly in removing colors from liquids. Syrup of sugar, for example, is allowed to drip through a layer of bone-black; all color is held by the charcoal and the syrup runs through clear and colorless. This is due to the charcoal's earthy matter and also to its being porous. Bone-black is also used to absorb disagreeable smells. Wood-charcoal is one of the most important varieties of carbon. Wood consists of carbon, hydrogen and oxygen. When heated in the open air, it burns away, except a small white ash; but if the air is partially cut off, only the gaseous matters escape, leaving the carbon. Billets of wood are stood on end in rows, making a large cone-like heap, which is covered with turf or moistened charcoal ashes, and holes left at the bottom for air to get in. An open space for a chimney is also left at the top, and the wood burns slowly from top to bottom and from center to outside. When fully burned, the heap is covered and left to cool two or three days. One hundred parts of wood average 24 parts by weight of charcoal. Charcoal is black and brittle, and keeps its wood-form. It is never pure carbon, usually from 65 to 96 per cent. Charcoal is largely used as a fuel, in some countries taking the place of coal. Its use in the reduction of iron-ore is important. Fence posts, telegraph poles and piles driven in mud or beds of rivers for foundations are often charred on the outside to preserve them from decay. It is also used in water filters, for tooth powder and as a medicine.

**Chares of Lindus,** the Rhodian sculptor. See Colossus of Rhodes.

**Charity, Sisters of,** an organization usually consisting of nuns or celibate women, founded by St. Vincent de Paul near Paris about the year 1633. The object of the sisterhood was to take care of the poor, especially the sick, and to educate children. Prisons, free schools, hospitals and almshouses were at once placed under their care.

The archbishop of Paris gave them the name of Servants of the Poor, which they have proudly kept ever since. The sisters became so useful and beloved that they were spared by the Revolution. They have since spread to almost every civilized country, and are doing a good and faithful work.

**Charlemagne** (*shär'lē-mān*), meaning Charles the Great, born April 2, 742, was the eldest son of Pepin, the first king of the Franks, of the Carlovingian dynasty. He was at first joint-king with his brother Carloman, but on the latter's death in 771 he became sole king. Six wars made him master of the Saxons, whom he Christianized. Crossing the Alps with two armies, he overthrew the kingdom of the Lombards in 774. In 778 he invaded Spain, and by his campaign against the Moors added a large region south of the Pyrenees to his kingdom. Ten years later Bavaria was made a part of his empire, and the savage Avars were conquered. In 800 he fought as the ally of the pope against the rebellious Romans. Here, while worshiping in St. Peter's church on Christmas Day, the pope set a crown upon his head and, amid the shouts of the people, saluted him as the emperor of the Romans. The remainder of his reign was spent in strengthening his vast empire, which extended from the Ebro to the Elbe. Bishoprics were founded; the country was divided into districts ruled by counts; and counts, called markgrafen, defended the frontiers from attack. A further element of strength was a great yearly military muster, attended by the high officials of the empire. Charlemagne was not merely a soldier; a learned man for his era, he had a school in the palace for the sons of his servants and set up schools throughout the country. He promoted commerce and manufactures; he also took an interest in farming, and had fruit trees brought from southern Europe and planted by his subjects on their lands. His fame spread to all parts of the world, the great Caliph Haroun-al-Raschid sending an embassy to show his respect. Charlemagne was tall and looked every inch a nobleman. The greatness of his kingdom ended with his own life. His successors were weaklings, and the great empire fell to pieces. Yet his attempt to maintain order and observance of law among his people and to gather small tribes into one great nation, had great effect in making Europe civilized. He died Jan. 28, 814.

**Charles I,** king of England, born Nov. 19, 1600, was a weakly child, unable to speak until his fifth year or to walk until his seventh. He, however, outgrew both defects, became active in outdoor sports and was an accomplished scholar. He succeeded his father in 1625, and the same year welcomed, at Dover, his little bright-eyed queen, the French Princess Henrietta Maria, whom he had married by proxy six weeks earlier. At first he was the mere tool of Buckingham, but after that noble's murder in 1628, he gradually submitted himself to the guidance of his wife. It was his yielding to her influence and also to that of Stafford and Laud, that caused the rupture between the king and Parliament. The struggle was caused by Charles' determination to get money without rendering an account of it. For eleven years he ruled without summoning a parliament. His attempt to make the inland counties pay a ship-tax was met by the resistance of Hampden; while Laud's foolish attempt to force the Scottish church to become English arrayed the whole northern kingdom against him. In 1640 two parliaments met; the short parliament, which lasted but three weeks, and the long parliament, which outlasted Charles. Afraid that the queen would be impeached, he signed the bill which sent Stafford to the block. Then came Pym's Grand Remonstrance, as it was called, and Charles' attempt to arrest the five members of Parliament who had gone farthest in opposing him. In 1642 began the Civil War, in which Charles showed great bravery but which resulted at the battle of Naseby, in the utter destruction of his cause. He was tried and condemned to death, and on the 30th of January, 1649, was beheaded. His faults were as a ruler. As a man, a husband and a father, one English prince alone is worthy of being named beside him—the late prince consort. It has been well said: "No man so good was ever so bad a king."

**Charles II,** king of England, born May 29, 1630, was present with his father at the battle of Edgehill, when but 12 years old, and in 1646 he escaped to France. In 1650 he landed in Scotland, was crowned at Scone, and with 10,000 Scots marched into England, but was defeated and his army put to rout by Cromwell at Worcester. For six years Charles wandered about, a fugitive with a price of £1,000 set on his head now hiding in an oak tree and anon disguised as a serving-man. More than 40 persons shared in his secret, yet not one betrayed him, and he escaped from the country. On the fall of the protectorate in 1660 he was recalled to the throne. His first adviser was Lord Clarendon, who was succeeded by the cabal or cabinet, and they by Shaftesbury. He was unpatriotic, selling to France Dunkirk, a French town which the English had long held, and also secretly taking money from Louis XIV for not opposing the schemes of France. Two wars with Holland; religious troubles at home; the struggle to prevent the king's brother James, duke of York, from being declared heir to the throne; and the Popish and Rye House plots made up the political incidents of his reign. Under Charles II

happened the great plague, when nearly 70,000 Londoners died, and the great fire which burned 13,200 houses. His reign has been called the worst in English history; a friend said that "he never said a foolish thing, nor ever did a wise one"; yet he was interested in science, was always popular and was nicknamed the Merry Monarch. Charles died Feb. 6, 1685.

**Charles VII,** king of France, born Feb. 22, 1403, succeeded his father, Charles VI, in 1422, when all northern France was held by the English, who proclaimed Henry VI, of England king of France. The English, after some successes, laid siege to Orleans, the capture of which would wholly cut off the French from the north. At this time the famous Joan of Arc, the Maid of Orleans, by her wonderful courage and belief that she was sent by Heaven to deliver her country roused the courage of nobles and people. The siege was raised, the English retreated, and soon lost all they had gained in France. In 1437 Charles entered Paris and spent the remainder of his reign in restoring order and prosperity to France, after the great misfortunes the country had suffered. He died July 22, 1461.

**Charles IX,** king of France, the second son of Henry II and Catherine dei Medici, was born in 1550 and succeeded his brother, Francis II, in 1560. He was weak and wavering, and led in all things by his mother. It was her counsel that drove him to authorize the massacre of St. Bartholomew's Day. He died May 30, 1574.

**Charles X,** king of France, the grandson of Louis XV, was born at Versailles, Oct. 9, 1757. He received the title Comte d' Artois, and in 1773 married Maria Theresa of Savoy. After the fall of the Bastille, in 1789, he headed the first emigration of nobles and took the lead in the attempts made to restore the monarchy. Under Louis XVIII Artois headed the royalist party, and by the death of that monarch became king under the title of Charles X. At first he was popular with all parties, but it was soon plain that he wished to make his rule as absolute as that of the old French monarchy. The people became discontented, and a struggle ensued with the chamber of deputies. On July 26, 1830, the king signed the five well-known ordinances, putting an end to the freedom of the press, making a new mode of election and dissolving the chamber that had just been elected. Paris at once took up arms. In three days the revolution was finished, Charles was driven from the capital, and Louis Philippe declared king. Charles lived the remainder of his life in exile. He died Nov. 6, 1836.

**Charles V,** emperor of Germany, was born at Ghent in 1500. From his father he inherited the Low Countries and from his mother Spain and Naples, together with the Spanish colonies in America. In 1516 he became joint-ruler of Spain with his mother Juana, and in 1519 he was made emperor of Germany. The history of western Europe for the next quarter of a century is largely made up of the rivalry of Charles and Francis I of France. The other powers, Henry VIII of England and the different popes favored first one and then the other, which resulted in war between the monarchs during much of the era. Most of the fighting was done in Italy, where the possession of Milan was in dispute. First, Charles V drove the French out of Italy and besieged Marseilles. The next year Francis, in trying to recover Milan, was taken prisoner at the battle of Pavia and had to buy his freedom by giving up all he had been fighting for. Charles was now so successful that the Holy League, with the pope at its head, was formed against him. An army under Constable Bourbon sacked Rome and imprisoned the pope, Charles claiming to have nothing to do with it; but it left him master of Italy. But now trouble called him home to Spain. An insurrection had arisen, which he put down, and at the same time by his tact made himself popular throughout the country. In Germany he found himself opposed by the Protestants, who had formed in defense the League of Smalkald. Threatened by an invasion of the Turks, he was forced to agree to many of their demands. In 1535 he accomplished the most brilliant of all his exploits, the destruction of the power of the great corsair, Barbarossa, and the capture of Tunis. A later expedition to put down the Algerian pirates was badly wrecked, and Charles himself had great trouble in reaching the coast of Spain. By two more wars with France, when Francis went so far as to call on the Turks to help him, he triumphed over the French king. Two things he now wished to effect, but in both of which he failed, were to suppress the Protestant party in Germany and have his son Philip accepted as heir to the empire, and not merely to the throne of Spain. The young and brilliant Maurice of Saxony, by suddenly opposing Charles with a secretly gathered army when his own was scattered, obtained from him lawful recognition for the Protestants. The German princes declared in favor of Philip's brother Ferdinand as their next emperor. Baffled by his unruly German subjects, seeing no way to keep his empire from being divided at his death, the disappointed emperor resigned his throne in 1555. The three remaining years of his life (he died Sept. 21, 1558) were spent in retirement in a Spanish monastery. Charles was in person slight, graceful in manner and popular with all classes of his subjects among the various peoples under his sway.

**Charles XII,** king of Sweden, was born June 27, 1682, the son of Charles XI. As-

cending the throne when 15 years old, his boyishness tempted Denmark, Poland and Peter the Great of Russia to attack Sweden, at that time the great power of the north. Charles at once besieged Copenhagen and forced a peace. Next, with 8,000 Swedes, he attacked the camp of the Russians, 50,000 strong, and in the battle of Narva routed them with great slaughter. The king of Poland was now driven into the heart of Saxony, conquered and dethroned. In 1700 Charles invaded Russia with an army of 43,000, almost captured the czar and won several battles. But here, trusting to the promises of the Cossack, Mazeppa, the Swede turned southward to meet him. Mazeppa and his troop failed to come up. His reënforcements cut off, he was forced to winter in a hostile and barren country, losing half his army; and though in the spring he marched at once on Peter, he was defeated. With a handful of attendants he fled across the Turkish border, but instead of gaining the sultan as an ally, Russian spies spread such reports about him that he was arrested and imprisoned. In 1714 he escaped and made his way through Germany and Hungary in 16 days. But his love of fighting was only intensified by his misfortunes, and a project now entered his head that promised fighting enough. This was to make peace with Peter, conquer Norway, next land in Scotland and replace the house of Stuart on the English throne. When at peace with the czar, he burst into Norway, and early in 1718, while urging on siege-works in the dead of winter, he was killed by a musket-ball from the fortress. Charles was almost foolishly brave; his dress was simple, and he shared the coarsest food and the hardest labor with the common soldiers with a cheerfulness that won their devotion.

**Charles XIV** of Sweden. See BERNADOTTE.

**Charles the Bold** (Duke of Burgundy), son of Philip the Good of Burgundy, was born Nov. 10, 1433. He succeeded his father as duke in 1467. He was the lifelong enemy of Louis XI of France. Joining with other great nobles in fighting for what they considered their rights as against the crown, their army threatened Paris and defeated the king. The province of Burgundy had once been a kingdom, and Charles now planned to restore it by conquering Lorraine, Switzerland and Provence. In this, however, he was not successful, being twice defeated by the Swiss. Finally, in a battle against the Duke of Lorraine, fighting with his usual courage and boldness, he was killed, Jan. 5, 1477. Richer and more powerful than any prince of his time, of great size and strength, his great ambition and reckless boldness combined to make him the most striking figure of the period.

**Charles Edward** (the Young Pretender), the son of James Stuart, the first Pretender, was born at Rome, Dec. 31, 1720. Unlike his father and grandfather, he was talented and firm of purpose. As a boy he served in the Spanish army against Austria. On the breaking out of war between France and England in 1744, the French furnished him with a powerful fleet and an army under the command of Marshal Saxe, the greatest soldier of the time, with which to secure the throne of the Stuarts, but the expedition was driven back by storms. The French refusing to let him try again, he managed to collect enough funds to fit out two small vessels. One was driven off by a British cruiser, but the second bore Charles to Scotland, where an army of Highlanders slowly gathered about him. He destroyed an English army sent against him at Prestonpans, which gave him such a reputation that he marched to within 100 miles of London, which he could have captured, but the Highlanders forced him to retreat. After winning the battle of Falkirk, his Highland chiefs forced him again to retreat to the Highlands, where the disastrous defeat of Culloden ruined his cause. He might have won this battle, too, had not the MacDonald clan refused to charge, sulking because they had been moved from their traditional position on the right wing. After months of wandering, the Pretender escaped from the country. He lived in Europe as the Count of Albany, until his death at Rome in 1768.

**Charles I,** Emperor of Austria, born Aug. 17, 1887, succeeded Francis Joseph on the throne Nov. 21, 1916. He was educated in the public schools of Vienna and later entered the army, taking an active part in the Great War. He is simple and unaffected, greatly beloved by his people.

**Charles, Law of.** When a constant mass of gas is heated, either or both of two things may happen to it. (1) The effect may be to increase the volume of the gas while the pressure remains the same; (2) the effect may be to increase the pressure of the gas while the volume remains constant; or (3) both the volume and the pressure may be changed simultaneously. Charles' law, which might more properly be called Gay-Lussac's law, tells us just how these changes take place. If the mass and pressure of the gas remain constant, then the volume of the gas increases $\frac{1}{273}$ part for each degree centigrade through which it is heated. Thus, if we denote by $V_0$ the volume of the gas at the temperature of melting ice, its volume at any other temperature, $V_t$, will be given by the following equation:

$$V_t = V_0[1 + 0.003665\ t°]$$
$$= V_0[1 + \tfrac{1}{273}]$$

The fact thus described is known as Charles' law. If the volume remains constant and

the pressure changes, the effect is described by the following equation:

$$P_t = P_o[1 + 0.003665\ t°]$$

where $P_o$ is the pressure at the temperature of melting ice and $P_t$ the pressure at t°. If pressure and volume both change, then

$$P_t V_t = P_o V_o [1 + 0.003665\ t°]$$

The student should be warned that this law of Charles is very accurately true for all gases throughout a moderate range of pressures, but is not exactly true for any gas, and does not hold at all in the case of vapors.

**Charles Martel,** meaning CHARLES THE HAMMER, was born about 688. He was mayor of the palace under the last Frankish kings of the Merovingian dynasty, and was the real ruler of the Franks. He carried on wars with the Saxons, the Alamanni and the Bavarians; but his great service to Europe was his driving back of the Saracens. They had already taken Bordeaux and had advanced to the Loire, when Charles met them in 732, and after a hard-fought battle wholly defeated them. This was one of the most important victories in the world's history, and probably kept Europe from becoming a Mohammedan country and being to-day no further advanced than Arabia. Charles died in 741.

**Charleston,** the chief city of South Carolina, was founded in 1670 as an English colony. It was captured by the British in 1780. The first ordinance of secession was passed here, and the reduction of Fort Sumter in its harbor was the first conflict

of the Civil War. In 1861 nearly half of the city was burned to the ground, and it was in a state of siege during the last two years of the war. Then again, in 1886, a heavy earthquake visited the city and wrought $8,000,000 of damage.

Charleston is situated on a peninsula, formed by the Ashley and Cooper Rivers, while a third river, the Wando, unites with the Cooper at the city. The estuary formed by these rivers makes a magnificent harbor. It is even regarded as the safest on the Atlantic coast.

Fort Moultrie, at Sullivan's Island on the eastern side of the harbor, is one of the best equipped defenses on the coast. It and the naval station at Charleston, which occupies a tract on Cooper River, have cost the government several millions.

Charleston's commerce was almost destroyed by the Civil War, but much of that which entered other channels has been recovered, and the terminal docks for two ocean-freight lines which were established in Charleston in 1901 have also increased the city's commercial prestige. Eleven manufactories are engaged in producing phosphate fertilizers, which is the leading industry; others of importance are tobacco, foundry and machine-shop products, oil and rice milling, bagging-factories, turpentine-casks and baskets for shipping vegetables and fruits.

Charleston has good public and parish school systems, and for higher education, the Charleston and Meninger High School, Academy of Our Lady of Mercy, Smith's school for young ladies, the South Carolina Military Academy, a state institution established in 1843, the state Medical College and many others.

The city has 60 churches and many charitable institutions. The buildings of note are the postoffice, built of Carolina granite, and the U. S. Custom-House erected of white marble. Population, 58,833

**Charleston,** capital of West Virginia and county seat of Kanawha County, is situated on the Kanawha River at its junction with the Elk. The Kanawha has an excellent system of locks and dams, which afford facilities for shipping coal from the rich New River mines. Charleston is the center of trade for large coal and lumber interests. Its industries include woolen-mills, machine-shops, boiler-works, iron-foundries, steel-plants, dye-works, marble-works, wagon-shops, glass-works, furniture-factories and one of the largest axe-factories in the world. It has many fine public buildings, among which are the Capitol and Capitol Annex, Court-House, Y M. C. A. building, modern and well-equipped houses and handsome churches. Population, 30,000.

**Charlestown, Mass.** Charlestown is situated at the mouth of the Charles River, opposite the old city of Boston. In 1873 it was annexed to the city of Boston. At that time it had a population of 28,000. It is the scene of the first real battle of the Revolution, that of Bunker Hill.

**Charlotte, N. C.,** a growing city and railroad center, the capital of Mecklenburg County, situated on Sugar Creek, 110 miles north of Columbia, capital of South Carolina. Its balmy climate and high average temperature are favorable for invalids. Gold has been found in the vicinity, and there is here a branch of the United States mint. It is the seat of Queen's College for girls. It has numerous manufactories and a good trade in cotton-goods, tobacco, iron-castings, and agricultural implements. Population, 50,000.

**Charlot'tenburg** is a large suburb lying to the west of Berlin. It is visited by tourists for the sake of the royal palace, built here in 1696 by Frederick I for his second wife, Sophia. The grounds and statuary are of great beauty. Charlottenburg has become the seat of many factories; and its population, which in 1871 was estimated at less than 20,000, has multiplied no less than tenfold.

**Char'lottesville, Va.,** a city, the seat of Albemarle County, on the Rivanna River and on the Southern and the Chesapeake & Ohio railroads, about 100 miles northwest of Richmond. It is the seat of the University of Virginia, founded in 1819 by Thomas Jefferson of Monticello, near by; also the seat of Albemarle College, Rawlings Female Institute and other educational institutions. Settled in 1744, Charlottesville became a city in 1888. It became a city of the first class in 1916, by the annexation of adjacent territory. Its industries embrace cigar-factories, wine-presses, flour, planing and woolen mills and textile manufactures. Population 12,000.

**Char'lottetown,** the capital of Prince Edward Island (which is separated from New Brunswick and Nova Scotia by Northumberland Strait) has a population of 13 000. It is nicely located on a good harbor in Hillsborough Bay. It has the main trade of the island. Its main industry is shipbuilding. The Prince Edward Island Railway, owned by the government of Canada, connects Charlottetown with the towns of the island, and a submarine telegraph connects the island with the province of New Brunswick, a distance of nine miles.

**Charter-House,** a famous school and hospital of London, founded in 1611. It first provides a good home for 80 "poor brethren." The Charter-House school maintains some 60 scholarships, worth from $375 to $475, which are open to boys from 12 to 15 years old. Besides the holders of these scholarships, many Londoners send their boys to this school because of its reputation. Blackstone, Addison, Steele, John Wesley, Grote. Thackeray, John Leech, Eastlake and many other men of note and ability were educated there. In 1872 the school was removed to Godalming in Surrey.

**Charter-Oak.** See ANDROS and HARTFORD.

**Chase, Salmon P.,** chief-justice of the United States, was born at Cornish, N. H., Jan. 13, 1808. He graduated at Dartmouth College, and entered the law, practicing at Washington, D. C. His edition of the *Statutes of Ohio*, now court authority, made him known as a jurist, while his arguments in several cases intrusted to him, in favor of the rights of fugitive slaves, brought him into great prominence. In 1841 Chase entered politics as an opponent of slavery extension and was one of the founders of the Free-soil party. In 1849 he was chosen senator from Ohio as a Democrat, but withdrew from that party soon after on the slavery question. On his record in the senate he was elected governor of Ohio by the Republican party in 1855, and re-elected two years later. He was secretary of the treasury in President Lincoln's cabinet from 1861 to 1864. On him fell the burden of finding the ways and means of carrying the government financially through the war. Legal-tender greenbacks, issuing of bonds and the national banking system were the chief means used. In 1864 he became chief-justice of the United States, and as the head of the supreme court presided at the impeachment trial of President Johnson. He died at New York on May 7, 1873.

**Chateaubriand** (*shà-tō'brē'ān'*), **François René, Vicomte de,** a French man-of-letters, was born in Brittany, Sept. 14, 1768. At the time of the French Revolution he took part at first with the exiled royalists, but, returning to France, was employed in a diplomatic service by Napoleon. On the murder of the Duc d'Enghein, he threw up his office as ambassador to the Republic of Valais. He supported the restoration monarchy, becoming a minister of state, and was appointed ambassador-extraordinary to England. He visited America when a young man, and afterwards traveled in the east. His love story of savage life, *Atala*, made his literary reputation. This appeared in 1801, and the *Genius of Christianity* added its quota to raise him to the foremost place among French writers of the day. Chateaubriand's books abound in passages of brilliant description, and there is no French author before him whose prose writings can compare with his in the power of conveying the beauty and mystery of nature. Chateaubriand is called the father of the French romantic school of writers. He died at Paris, July 4, 1848.

**Chateauguay** (*shà'tō'gā'*), a village in the county of that name in the province of Quebec, possessing a monument erected in 1895 to commemorate the victory there gained by Col. de Salaberry over the Americans in 1813.

**Chatham, Earl of.** See PITT.

**Chatham** (*chăt'ăm*), Northumberland County, N. B., is the chief town on the gulf coast of the province, lying on Miramichi Bay, with a fine harbor and much activity in shipyards, mills, foundries and lumber. It has a population of about 5,000. To the southwest, along the Miramichi River, are the best salmon grounds in Canada.

**Chat'ham,** a city of 10,317 in western Ontario. Situated on the River Thames. Considerable manufacturing is done here. A carriage-manufactory is one of its largest industries. It is in the natural-gas and oil district. The district surrounding it is particularly rich and fertile. It is growing rapidly, its natural advantages proving attractive.

**Chattahoochee** (*chăt'tà hōō'chē*), a river in Georgia, which takes its rise in the northeast part of the state, in the Blue Ridge Mountains, and, flowing south, between Georgia and Alabama, unites with Flint River to form the Appalachicola. Its length is over 500 miles, and it is navigable for over 200 miles to Columbus. It is famous in literature as the subject of Lanier's poem, *The Song of the Chattahoochee.*

**Chat'tanoo'ga, Tenn.,** a city, the county seat of Hamilton County, on the Tennessee River and on a number of railway trunk-lines. For eight or nine months of the year the river is navigable as far as Chattanooga. It is the seat of the University of Chattanooga, McCallie Preparatory School, Baylor School, Girls' Preparatory School, and also of Baroness Erlanger Hospital; it has many fine civic buildings, an opera house, public library and a number of attractive churches and fine schools. The city has a large trade in coal, iron, grain and lumber, its industries embracing the manufacture of steel and iron, machinery of various kinds, furniture, bricks and tiles, cotton goods, carriages and cars. In the vicinity is the Chickamauga National Military Park, marking the scene of the battle of Chickamauga (Sept. 1863). During the Civil War the city and neighborhood were the scenes of much and calamitous fighting, the city especially suffering. A sad evidence of the bloody struggle of the era is the national cemetery here, which contains about 13,400 graves. Population, 57,000.

**Chattanooga, Battle of,** a series of bloody engagements, in the Civil War, fought at Chattanooga, Tenn., and immediate neighborhood, Nov. 23-25, 1863, between the Federal army (60,000 strong) under General Grant and the Confederate forces (numbering 40,000) under General Bragg, and ending disastrously for the south. The battle had for its initial acts the expulsion of Bragg by Rosecrans from Chattanooga, and the battle fought at Chickamauga (Sept. 19-20, '63), in which the Union army was defeated and driven back to Chattanooga, where General Thomas, who had succeeded Rosecrans in command of the Army of the Cumberland, was besieged by Bragg. At this juncture General Grant, who had been placed in command of the northern armies operating in the region, came on the scene, bringing with him General Sherman with a part of the Army of the Tennessee, Hooker with reinforcements from the east having just preceded them. Ordering Hooker's corps to attack Bragg's left, Grant entrusted to Sherman the duty of attacking the southern right, while Thomas was to engage the center. Hooker forced his way up Lookout Mountain and had a notable engagement with the enemy in what is romantically known as the Battle above the Clouds, afterwards gaining a position on Bragg's left and rear. Sherman's attack met with stubborn resistance, and desperate fighting ensued without decisive results. Finally the forces under Thomas charged and carried the enemy's rifle-pits at the foot of the Ridge and in the absence of orders, rushed up the steep face of Missionary Ridge, and won the crest and the day. The storming of this Ridge has been noted as one of the most heroic achievements of the war, besides being vitally disastrous to Bragg and his army, which retreated toward Atlanta. See *War of the Rebellion Records*, also *The Army of the Cumberland* and *Battles and Leaders of the Civil War.*

**Chaucer** (*cha'sĕr*), **Geoffrey,** English poet and man of affairs, was born about 1340. Of his early boyhood we know nothing. At the age of seventeen we find him a page in the service of the wife of the Duke of Clarence, and at nineteen see him in the army of Edward III fighting the French, when he was taken prisoner, but later on was ransomed. He married about 1360 the sister of the future wife of John of Gaunt. He was given a pension by the king, and sent afterward to the Continent as commissioner or diplomat. In 1386 he lost two of the offices he was holding, why we know not, and from that time until his death misfortune pursued him. He seems never to have made provision for old age, and now many dark days came to him, though things went a little better when Henry IV, the son of his old friend, John of Gaunt, came to the throne. While on the king's business he visited Italy, and we find in most of his poems indications that his idea of poetry, what it is and should be, as well as his style and many of his plots and subjects, were taken from the great Italian poets, Dante, Petrarch and Boccaccio. The first of his great poems was *Troilus and Cressida*, but not until the darkness of poverty and old age came upon him, did he write the *Canterbury Tales*, of which the *Prologue* is the chief work. The *Tales* are related by a company of pilgrims on their way to Canterbury, who gather at an inn and agree each to tell a tale in going and returning; he who should

tell the best tale was to be treated by the others with a supper at the inn. Chaucer is known as the father of English poetry, and not only is he the first great poet of the race, but, in order of merit, he is among the first of all our poets. Chaucer wrote when the English language and spelling were not yet fixed, and one needs almost to learn a new language to read him, though some of his poems have been published with modern spelling and explanatory notes. Spenser called him "that welle of Englishe undefyled." The poet died about the year 1400, and was buried in Westminster Abbey.

**Chaudiere** (*shō'dyâr'*), a Canadian river about 120 miles in length, which flows through the southern portion of the province of Quebec. Its source is in Lake Megantic, near the border of the state of Maine and it joins the St. Lawrence opposite Quebec, or, rather, some seven miles above the historic city. Near its mouth occurs one of the cataracts known as Chaudière Falls, whose height is about 100 feet. Another cataract of the same name occurs in the Ottawa River, near the Dominion capital.

**Chautauqua** (*shà-tą'kwà*), a popular resort on Chautauqua Lake, New York state. Here Lewis Miller founded in 1874 the Chautauqua Assembly to give instruction to Sunday-School teachers, and out of it grew the wider Literary and Scientific Circle, "to direct the reading habits of grown people." It consists of a fou years' course of home reading under the oversight of the Chautauqua officers. There are about two hundred thousand members of the circle, scattered over the world. Dr. John H. Vincent, chancellor, was the best exponent of the spirit of the institution. As expressed by him, the "Chautauqua idea" is "a plea for universal education." He was convinced that "a college is possible in every-day life if one choose to use it."

**Checkers** or **Draughts,** a popular game, supposed to have come in early times from Egypt, and played on a board, somewhat after the chess-board pattern, in various ways in many modern countries. The familiar form is that played by two persons, each being given 12 checkers, (one using the white ones and his opponent the black, or *vice versa*), on a square board, divided into 64 equal squares, alternately black and white, the checkers at the beginning of the game being placed on the three near lines of squares (usually on the black ones). The moves are made diagonally across the board on to an unoccupied square, with the design, at close range of one's adversary, of capturing his men by jumping over the piece and removing it, the moves being made diagonally to a square unoccupied and clear to land on. The jump or move may be continued, if other men on the opponent's side are also exposed to capture, when they are similarly leaped over and removed from the board, provided that there be again a vacant square to occupy in making the leap. When the opponent's back line of squares is reached and occupied, the player gets his man kinged or crowned, by placing another checker of the same color on top of it. This kinged man is then free to move back and forth on the board, one square at a time (unless checked by the adversary), and is thus in a more favorable position to win the game. For further details see any checker's manual or treatise on games.

**Chelsea** (*chĕl'sê*), a western suburb of London, England, on the north side of the Thames. The town has been the home of many famous English characters, Sir Thomas More, Princess Elizabeth, Walpole, Swift, Carlyle, George Eliot and others. It is widely known as the seat of Chelsea Hospital for old and disabled soldiers, whose foundation-stone was laid by Charles II in 1682. About 550 pensioners are housed here, but all of the pensioners of the empire (about 88,000) are called out-pensioners of Chelsea.

**Chelsea,** a city of Suffolk County, Mass., population, 43,121. Chelsea is a suburb of Boston; it was settled as a part of Boston in 1625, was set off as a town in 1739, and became a city in 1857. It is connected with Boston by railroad, electrics and ferry. This ferry, the Winnisimmett, is the oldest in the country, dating from 1631. While most of its citizens do business in Boston, manufacturing interests have increased. Wall paper, clocks, boxes, boots, shoes, brass goods, pottery, rubber goods and hard-wood veneers are among the products. There are excellent schools, church and social organizations and a public library. A United States naval hospital faces the Mystic River, which separates Chelsea and Charlestown. In area the city is very compact, comprising little more than two square miles. In 1908 it was almost completely destroyed by fire.

**Cheltenham** (*chĕlt'nam*), a fashionable watering place in Gloucestershire, England. Its popularity came first from the benefit George III got by drinking its salt-spring waters. There are several colleges and fine buildings, and the absence of manufactures makes it a pleasant place to live in. Population 50,842.

**Chemistry.** The science of chemistry deals with the nature and composition of substances and with a certain class of changes which substances undergo. Chemical changes produce substances which are permanently different from the things from which they are formed. They take place when anything burns, ferments, decays or rusts; when substances combine to form new substances or when they are divided into other things; also when substances exchange some of their constituents. Examples of chemical changes are the explosion of gunpowder, where the

solid substance disappears and products which are largely gases are formed; the burning of a candle, where the fat or wax combines with oxygen from the air to form water-vapor and carbon dioxid; the rusting of iron, where a brown earthy substance is produced by the slow action of oxygen and moisture; the destruction of sugar by heating, where water-vapor and pungent gases come off and charcoal, a form of carbon, is left behind; the slaking of quick-lime, where water combines with the lime and much heat is produced; the action of metallic zinc in a solution of lead acetate, where zinc changes place with lead and a lead-tree is formed, together with soluble zinc acetate. The most careful experiments have shown that no gain or loss of total weight takes place during any chemical change. Matter cannot be destroyed, therefore, nor can it be produced in any circumstances whatever. This fact leads to the statement that there is a law like this in regard to energy. Physical changes are distinguished from those that are chemical in being merely changes of condition. For example, when a piece of glass is heated to redness it becomes soft, but it remains unchanged chemically and has the same composition and properties after it has cooled; when water is changed to steam by heating or to ice by cooling, it undergoes no chemical change, for the steam and ice may be readily turned into water again; when a piece of sulphur is crushed to powder the change is merely physical, for every one of the small particles is still sulphur; when common salt is dissolved in water it undergoes a physical change, for it may be regained unchanged by boiling off the water.

Chemistry has to do with the composition of all substances; not only those that occur naturally in the earth as minerals, or are produced by plants and animals, but those that are prepared artificially by chemical changes. Analytical chemistry deals with finding out what is contained in substances. This is qualitative analysis when only the identity of the constituents is sought, while it is quantitative analysis when their quantities are determined. A vast amount of research has shown that the innumerable objects that have been analyzed contain comparatively few kinds of matter or *elements*. As far as we know, each element contains only one thing, and all the evidence goes to show that it is impossible to change any element into another, even to the slightest extent. At the present time seventy-six elements are recognized by chemists, as follows:

*Gaseous non-metallic elements.* Argon, chlorine, fluorine, helium, hydrogen, krypton, neon, nitrogen, oxygen and xenon.

*Other non-metallic elements.* Boron, bromine, carbon, iodine, phosphorus, selenium, silicon and sulphur.

*More common or important metallic elements.* Aluminium, antimony, arsenic, barium, bismuth, cadmium, calcium, chromium, cobalt, copper, gold, iron, lead, lithium, magnesium, manganese, mercury, sodium, nickel, platinum, potassium, silver, strontium, thorium, tin, titanium and zinc.

*Rarer or less important metallic elements.* Beryllium, cæsium, erbium, gadolinium, gallium, germanium, indium, iridium, lanthanum, molybdenum, neodymium, niobium, osmium, palladium, praseodymium, rhodium, rubidium, ruthenium, samarium, scandium, tantalum, tellurium, thallium, thulium, tungsten, uranium, vanadium, ytterbium, yttrium and zirconium.

Most of the elements included in the last list are exceedingly rare, and are found only in minerals which occur in small quantities and in but few places. The elements given in the other lists vary enormously in their abundance. About one fifth of the atmosphere, exactly eight ninths of pure water and nearly one half of the earth's crust are made up of oxygen. Silicon, which occurs in combination with oxygen as quartz and in silicates, is next to oxygen in abundance, while calcium, the metal of limestone, and aluminium, the metal of clay, occur in large quantities. Magnesium, iron, potassium and sodium are also very important constituents of rocks; carbon, oxygen, hydrogen and nitrogen make up the greater part of plants and animals; but calcium, phosphorus, potassium, sulphur, iron and a few other elements are also required by living things in larger or smaller quantities. Plants get their carbon from the carbon dioxide of the air; hydrogen and oxygen are taken in by the roots in the form of water, and from the soil also are taken the nitrogen and the other elements that plants require. Animals obtain their nourishment directly or indirectly from plants, so that they contain no elements that are not found in vegetable matter. The term, organic chemistry, originally referred to the chemistry of the substances produced by plants and animals, and it was formerly supposed that these substances could be produced only by living organisms. Many of the products of life, however, such as alcohol, some of the sugars, indigo, oil of wintergreen and many others, have now been made artificially, so that there is no necessity for classifying these products by themselves. For convenience, however, substances containing carbon, the characteristic element of living things, are still called organic, and they include a vast number of artificial substances that do not occur in nature. The chemistry of all substances that do not contain carbon is called inorganic chemistry.

All substances that are not elements are either mixtures or chemical compounds, containing two or more elements. These two classes are to be distinguished by the fact that compounds do not vary in composition, while mixtures may vary greatly. Examples

of chemical compounds are water, composed of hydrogen and oxygen; sugar and alcohol, both of which contain carbon, hydrogen and oxygen; common salt, which is made of sodium and chlorine and has the chemical name of sodium chloride; quartz, called silica or silicon dioxide, which contains silicon and oxygen; and potassium chlorate, which is composed of potassium, chlorine and oxygen. Different samples of any chemical compound, when pure, always contain the same elements in exactly the same proportions by weight or in definite proportions. The same elements often form several compounds by combining in several different proportions; there are hundreds of compounds containing only carbon and hydrogen. It is true, also, that the same elements, combined in exactly the same proportions, may form a number of entirely different substances. This last fact, as well as many other chemical facts, is explained by supposing that the elements are composed of exceedingly small indivisible particles called *atoms*. All the atoms of each element are believed to be alike, and atoms of different elements are supposed to make up the molecules or smallest possible parts of compounds. The existence of several compounds of the same composition is explained by assuming that the atoms have different arrangements in the molecules. The atomic theory has been developed so elaborately that chemists are able to assign definite relative positions to the atoms in the molecules of a great many compounds, and the relative weights of the atoms of most of the elements have been determined with great accuracy, although their actual weights are unknown. However, since atoms have never been seen (and in all probability never will be seen on account of their small size), their existence cannot be said to be proven.

Most of the substances met with in everyday life are mixtures of chemical compounds. Such are most articles or materials of food and raiment, wood, bricks, paper, glass, rocks, soils, etc. There are a few familiar mixtures of elements, such as metallic alloys, steel and also atmospheric air, which consists chiefly of nitrogen and oxygen.

Our present chemical theories and the greater part of our chemical knowledge have been developed in comparatively recent times. The discovery of oxygen by Priestley in 1774, the correct explanation of combustion shortly afterward by Lavoisier and the founding of the atomic theory by Dalton during the first decade of the last century were important events which mark the beginnings of modern chemical science. Chemical knowledge is still rapidly increasing. In both the inorganic and the organic fields natural substances are being examined, new compounds are being prepared and the laws which govern chemical changes are being studied.

Chemistry has given and is giving much assistance in a practical way to medicine, agriculture, metallurgy and many other branches of art and industry, and still more important advances in these directions are to be expected in the future.

HORACE L. WELLS.

**Chem'otax'is** (in plants), the sensitiveness of an organism, free to move about, to a one-sided chemical stimulus (see IRRITABILITY), to which it responds by taking up a definite attitude with respect to the direction from which the substance is diffusing. Since no plants (except possibly the myxomycetes or slime-moulds, which see) are free to orient themselves thus unless they are immersed in water, it follows that the substance in order to act must be soluble and diffusible in water. Thus the sperms (male cells) of mosses will so place themselves in a diffusing current of sugar particles that, as they swim, they move toward the source of the sugar. Such agencies are believed to determine the movement of the sperms toward the egg in many plants.

**Chemot'ropism** (*kĕ-mŏt'rō-pĭz'm*), the sensitiveness of a plant to a onesided chemical stimulus (see IRRITABILITY) to which it responds by changing the rate of its growth in certain regions, and thereby putting the part affected in a new position with respect to the diffusing particles. It differs from chemotaxis only in the nature of the reaction. Diffusing gases or solutes (but usually the latter) may effect the reaction. Thus the growth of the germ-tubes arising from growing spores of fungi is directed by their chemotropism. When, for example, a spore falls upon a leaf on or in which the fungus can develop, it sprouts, and when the young germ-tubes reach the stomata (which see), they turn in and ramify in the interior. Or they may penetrate an epidermal cell at once. It has been shown in both cases that the directive influence is the presence of foods in the leaf. The pollen-tubes are similarly controlled in their growth down the style to the ovules (see FERTILIZATION).

**Che'ops.** See PYRAMIDS.

**Cherbourg.** See BREAKWATER.

**Cherokees** (*chĕr'ō-kēz*), a tribe of North American Indians who were found by the whites in possession of the upper valley of Tennessee River and the rivers and mountains of the Alleghenies, and occupying 64 towns. Meeting the English colonists first, they became their friends and took part with them in the wars against the French. During 1757–61 they were most of the time at war with the English, the trouble growing out of robberies of provisions from the settlers by the Cherokees, who were driven to thievery by hunger on the homeward march, after fighting for the colonists. They yielded to the whites, after losing most of their houses, cattle and horses. During the Revolution they took the side of the British. After the

war a part of the tribe moved west of the Mississippi to find better hunting-grounds, and in 1838 the government removed the remainder. In the Civil War they divided, Cherokees being in each army. The tribe learned several kinds of manufacturing, gradually gave up hunting, and up to the outbreak of the war held many slaves. There have been schools and missions among them for a long time. They are also rich, the government holding for them over $1,500,000. They number about 14,000.

**Cher'ry,** certain species of the genus *Prunus*, which belongs to the rose family. The cultivated tree-cherries are said to have come from two European species. The berries are also distinguished in general as sweet and sour cherries. It is the latter kind which is usually cultivated for canning, the sweet cherries being mostly confined to dooryard planting. In Japan cherries are specialized for their beauty, Cherry-blossom time being a holiday season. Our wild red cherry, pin, bird or pigeon cherry, is a graceful little tree, its bark smooth and shining, its leaves ever twinkling, and none could pass it by unnoticed in April and May, then all snowy, fragrant bloom. Its rich red fruit is a prime favorite with the birds. This tree, a quick grower and short-lived, is an excellent nurse for young forest trees. The choke-cherry is generally but a shrub, though attaining considerable size in the region lying between Nebraska and northern Texas. Both in time of blossoming and in fruit-bearing it is very attractive, the blossoms having long, fleecy bunches. Later the branches droop with the long stems aset with glowing gems, changing through various shades of yellow and red to the dark crimson of the ripe fruit —occasionally yellow when ripe. The fruit is very good to look at but very bitter to eat, puckery and harsh to the taste.

The wild black cherry or rum-cherry, is a very valuable timber tree. It grows to the height of 50 to 90 feet, the polished wood, a rich, lustrous brown, rivalling mahogany and rosewood. It was once abundant on the Alleghany slopes, but is now quite scarce. See Rogers: *The Tree Book*; Lounsberry: *A Guide to the Trees*.

**Cherubini** (*kā-roo-bē'nē*), **Maria Luigi Carlo Zenobio Salvatore,** an Italian composer, was born at Florence in 1760. He began to study music at the age of six. He produced successful operas, and in 1800 brought out one of his masterpieces, *The Water-Carrier*. Soon after he turned his mind to church-music, in which he became very distinguished, his first work being the *Mass in F*. His operas resembled Mozart's in many respects. He died March 15, 1842.

**Chesapeake Bay** (*chĕs'ā-pēk*), meaning mother of waters, the greatest inlet in the Atlantic coast of the United States, enters Virginia and extends into Maryland. It is 200 miles long and from four to forty miles wide. Cape Charles and Cape Henry mark its entrance. It receives the Susquehanna, Potomac, James and other rivers. The Chesapeake is so deep that the largest ships can steam up its entire length. It is also the most southern of the deep-water bays, all those to the south being shallow.

**Chesapeake, The,** a frigate of the United States Navy, historically noted in the War of 1812 with Great Britain and in the preliminary impressment-controversy period. The latter period was the one when the British government refused to recognize the naturalization abroad of her subjects as absolving them from their inalienable allegiance. In the intercourse between this country and England, early in the last century, it was a frequent practice on the part of British seamen, when their ships touched at American ports, to desert and become American subjects. This naturally offended England and annoyed the captains and officers of her ships when desertions occurred on this side; so much so that it became a frequent occurrence to overhaul American ships and take from them deserters and even American subjects on the high seas. One instance of this connects itself with the United States frigate, *The Chesapeake*, which soon after sailing from Hampton Roads, on June 22, 1807, was overhauled for deserters by the British warship *Leopard*. Though unprepared for action, *The Chesapeake* resented the insult to the American flag and refused to submit to inspection or to surrender any of the foreign portion of her crew. At this *The Leopard* opened fire and forced *The Chesapeake* to haul down her flag and give up the three colored deserters aboard her. The unfriendly act, though disowned by Britain (the government of the latter refusing all redress) did much to embroil the two nations and precipitate the War of 1812–14. When the latter was in progress, *The Chesapeake* was again to figure in a sharp encounter with a British warship, *The Shannon*, commanded by Captain Broke and carrying 52 guns. On this occasion, *The Chesapeake*, which was then commanded by Captain Lawrence, and had an armament of 50 guns, was in better shape than formerly to take her part in the action that followed, save that she had a practically untrained crew. The two frigates met just outside of Boston, on June 1, 1813, and at once an engagement ensued. So hot was the *Shannon's* fire and so indifferently was it returned by her American adversary, that the encounter lasted but fifteen minutes, when *The Chesapeake* was forced to surrender, in spite of her gallant captain's charge to his men, as he was carried below mortally wounded: "Don't give up the ship." *The Chesapeake* became *The Shannon's* prize, and was taken by the latter into Halifax harbor, afterwards and for a few years sailing under the British flag. The casualties of the encounter were

many on both sides; out of a crew of 379 *The Chesapeake* lost 61 in killed or mortally wounded, and 85 more or less severely wounded; *The Shannon's* losses (out of a crew of 330) were 33 killed and 50 wounded. See Cooper's *History of the Navy of the United States* and Roosevelt's *The Naval War of 1812*.

**Chesapeake and Ohio Canal,** a project, favored in 1774 by Washington, to connect the great inland lakes by a navigable waterway from Lake Erie across the Alleghenies, utilizing the affluents of the Ohio River, thence to tidewaters on the Potomac. The undertaking was not in his day put into effect; though in 1820 it was revived by the state of Virginia, and a company was organized to construct the Chesapeake and Ohio Canal, from Georgetown, D. C., to Cumberland, Md., by utilizing the waterway of the Potomac and tunneling the mountains beyond Paw-Paw Bend, thence to Cumberland. The project was completed in 1850, at a cost exceeding 11¼ million dollars. The canal has a length of 185 miles, and by means of about 75 locks (100 feet in length by 15 feet in width) it gains a total elevation of over 600 feet, the water being supplied by the Potomac. The depth of the canal is 6 feet, while its width to Harper's Ferry is 60 feet on the surface and 42 feet at the bottom. The continuation of the canal to tap the inland lakes is a matter still in the future; though of late the city of Pittsburg, Pa., has taken hearty interest in the scheme, both by urging the Federal authorities to carry the canalization of the Monongahela River south to Fairmont, W. Va., and by planning to construct a canal, 16 feet deep and estimated to cost over $30,000,000, from Pittsburg to Ashtabula, Ohio, on Lake Erie.

**Chess,** a game played with pieces of different value upon a board chequered in two colors and divided in sixty-four squares, is the most ancient of all the current games of skill. Chess is probably of Asiatic origin, although a game similar to it was known to the Egyptians. One of the earliest books to be printed in English was Caxton's *Ye Game and Playe of ye Chesse* (1479). The literature upon chess is at the present time enormous.

The pieces at the disposal of each player are a king, a queen, two bishops, two knights, two castles or rooks and eight pawns. The king moves in any direction one square; the queen, so far as the board is free, either diagonally or horizontally; the bishop, diagonally on its own color; the knight, one square horizontally or vertically and one square diagonally; the castle, horizontally and vertically; the pawns, to the next square in front. For the peculiar moves in castling, capturing and moving two squares with pawns, and "queening" the pawn, the reader is referred to books upon chess.

In theory, since the forces of each player are equal, every game of chess if rightly played should end in a draw. But the charm of chess arises from its infinite variety. No two games are alike. None the less, the best openings in chess have been reduced to a science, so that the earnest student of the game needs to practise the standard openings as given in books. There is no better plan for the learner than to play over the published games of the great masters.

The strategy of chess imitates that of war. The king is for each player the final object of attack and defence. Often, however, it is better to direct the attack upon some other piece, and to weaken the enemy before attempting to checkmate him. A king is checkmated when he is attacked in such a manner that if he were not the king he must needs be taken. The value of chess as a mode of mental recreation is almost beyond praise. At the same time it may be too serious a study for the good of the scholar whose mind is overtaxed by mental work. Moreover, the virtue which chess is held to possess, of training the mental powers for other purposes than the game itself, would seem to have been exaggerated.

**Ches'ter,** a city in Delaware County, Pa., on the Delaware River, 13 miles from Philadelphia. It has a military and other colleges, shipbuilding yards and manufactures cotton and woolen goods, engines, etc. It was founded by the Swedes in 1643, and is the oldest town in the state. Population 40,000.

**Ches'terfield, Philip Dormer Stanhope, Lord,** was born in London, Eng., Sept. 22, 1694. He studied at Cambridge, and was a member of Parliament. He was acquainted with Swift, Pope, Johnson and other authors. It was by offering his patronage to Dr. Samuel Johnson, after his famous dictionary appeared, though he had withheld it before, that he drew from the indignant Johnson the witty letter declining the courtesy that is so famous in English literature. Chesterfield is best remembered by his *Letters to His Son*. He died March 24, 1773.

**Chest'nut,** species of the genus *Castanea*, which is closely related to the beech. There are about five species, which occur in the temperate regions of northeastern America, Europe, northern Africa and Asia. The peasants of Italy and Spain regard the chestnut as quite important. This chestnut is not sweet like ours, but very good when cooked. Three species are cultivated in this country for the fruit, namely, the European chestnut (*C. sativa*), also known as French, Spanish and Italian chestnut; the American chestnut (*C. Americana*); and the Japanese chestnut (*C. crenata*).

The European chestnut is a tall, spreading tree the burrs very large, the nuts larger than the American chestnut. The Japanese chestnut is a dwarfish, slender tree and

bears very large nuts, in quality generally not equal to the other chestnuts, though excellent when cooked.

The American chestnut rises to a height of 60 to 100 feet, and is a symmetrical tree with a heavy top. The bark is gray; the glossy leaves, from six to eight inches long, taper at both ends, making foliage of marked beauty and abundance; the flowers are catkins, which open in June and July and exhale a sweet heavy odor; two to three nuts are the fruit. The nuts hold

CHESTNUT

first rank among chestnuts, and are marketed in large quantities from the forests of the Appalachian region, from Maine to Georgia in the east and westward to Michigan, Mississippi and Louisiana. The tree is a valuable lumber-tree, the wood being used for interior finish, for furniture, railroad ties, fence posts and fuel.

A miniature chestnut is the chinquapin, occurring from Pennsylvania to Florida and west to Arkansas and Texas; in the last two states reaching the dignity of a tree, east of the Mississippi only a shrub. A single sweet nut is its fruit. Chinquapin nuts are on sale in their season in the markets of southern towns. The horse-chestnut does not belong to the same family as the above, but is treated under horse-chestnut. See Rogers: *The Tree Book;* Bailey: *Cyclopedia of American Horticulture;* Hodge: *Nature Study and Life,* chapter on Elementary Forestry.

**Cheviot** (*chē'vē-ŭt*) **Hills,** a mountain range in Northumberland and Roxburgh Counties, on the English and Scotch borders, 35 miles long. These hills are used as pasture-lands by the fine Cheviot breed of sheep. Here were fought many bloody battles between the Scotch and the English, and the name is commemorated in the famous old ballad of *Chevy Chase.*

**Chevy Chase.** See BALLADS.

**Cheyenne** (*shī'ĕn'*), the capital of Wyoming. It was founded in 1867, when the Union Pacific Railroad reached that point. It has large railroad shops, is a supply-point for surrounding ranches and mining camps, and is a shipping place of beef-cattle. Many cattle-men and mine-owners live here. Population, 11,320

**Cheyennes,** a tribe of Indians belonging to the great Algonquin family. They were found by the travelers, Lewis and Clarke, in 1803, on the Cheyenne River near the Black Hills. The tribe afterward divided, one part remaining in the north, joining the Sioux and fighting against the Crows; the other going south to the Arkansas and joining the Arapahoes. Treaties were made between both bands and the United States; but failure to carry out a treaty made in 1861 and an inhuman attack, made in 1864, by whites on what is known as Sand Creek village, killing 100 Cheyenne men, women and children drove the tribe into the field against the whites for the first time. This war cost the government many lives and about $30,000,000. The troops of General Hancock and Custer, in 1867, forced them to go on a reservation. The Cheyennes do not take kindly to schools. They number about 3,500.

**Chicago.** In the University of Chicago, there is a relief map which shows that the site of the second city in the United States and the fourth in the world, was, at no very remote age, covered by the waters of Lake Michigan. You would have had only to watch workmen excavating earth for any one of the nearly 12,000 buildings erected in 1912 to see the sand of this ancient beach turned up. In December, 1674, when Pére Marquette was guided to the Chicago River by Pottawattomie Indians, the plain was no more than six feet above lake-level—a dreary, frozen marsh, bounded by a wooded ridge ten miles back, the old shore-line, and relieved only by two low elevations of glacial drift—Stony Island (gravel) and Blue Island (clay). The saintly Jesuit, on his way to found a mission among the Illinois Indians, was conducted along the route that had long been used by the many Algonquin tribes of the upper lakes and the middle Mississippi. When the ice broke up and flooded the plain, the canoes were paddled out to the ridge, carried across a couple of miles and set afloat on the westward flowing current of the Desplaines. La Salle saw the strategic importance of the route and fortified Starved Rock on the Illinois. In 1803 the United States government built Fort Dearborn on the Chicago River to control the Indians around the head of the lake. Hither, in the same year, came John Kinzie, fur-trader and silversmith, with his family, to barter with the many tribes that used the Chicago trail or gathered here for council.

As the farthest point inland to be reached over the Great Lakes, with the shortest portage to the Mississippi system, nature

had endowed the spot, but had set it in a slough 960 miles across a hostile wilderness from the seaboard. The horrid massacre of Fort Dearborn August 15, 1812, was not followed by peace with the red man for 20 years. After the Black Hawk War (1831), the Indians of northern Illinois were removed to Iowa, and the vast region of fertile prairie behind Chicago was open to settlement. The town was organized in 1833 with 28 voters. In 1837 it was incorporated with a population of 4,497, which was but a fraction of the number that in five years had swarmed through the gateway. In 1848 it had grown to 20,000. It became plain to the least imaginative that if Chicago was to get any great advantage from its position, means must be provided for bringing in the products of the farms and for distributing supplies. It was easier and cheaper for settlers on the streams to load grain and cattle on flat-boats and send them to St. Louis, than to haul loads across Chicago's ten miles of slough. The Illinois and Michigan Canal connecting the Chicago and Illinois Rivers along the old canoe-trail, opened in 1848, extended Chicago's trade a hundred miles westward and taxed its shipping facilities. In the early 50's William B. Ogden overcame incredible financial difficulties, and pushed ten miles of railway (the North-Western) out to the boat-landing on the Desplaines. The first train out found a cargo of grain piled on the bank. From that small beginning of a half century ago Chicago has become the greatest railroad center in the world, the terminal of 36 lines, aggregating a mileage of 91,672 miles, or over 40 per cent. of the total mileage of the United States, with gross revenues of $2,900,000,000.

With a death-rate in the 50's that must wipe out the entire population in 40 years, Chicago undertook the colossal task of pulling itself up to a 20-foot level. For the first time in history four-story brick and stone buildings were hoisted on jack-screws 12 to 14 feet in the air without interrupting business. The sand-bar that turned the river a half mile south to seek an outlet, was used to raise the grade of the streets; the river was cut straight out to the lake; the channel and harbor were deepened; and pumping works on the South Branch reversed the current, drew water from the lake and washed Chicago's sewage into the canal. To-day the city stands 25 feet above lake level. In 1901 the Drainage Canal was opened. One of the world's greatest sanitary works, it is 25 miles long, 15 miles of it cut through solid rock. The system not only disposes of the sewage and guards the water supply from pollution, but is to provide a ship-canal to connect the Great Lakes with the Mississippi—a glorified canoe-trail that follows the red man's route. Five tunnels that extend under the lake from two to four miles out give the city a *per capita* water-supply of 200 gallons a day. The death-rate has been lowered to 13.5 per thousand, the lowest of any great city in the world.

The lesson of wide streets and substantial buildings Chicago had to learn through the most disastrous fire recorded in history. In October of 1871 the city had a population of over 300,000, mostly housed in crowded wooden buildings that had been dried to tinder by a long drought. Starting on the west side of the river, a strong southwest wind hurled brands on bridges and shipping and so across the stream. The business section was wiped out east to the lake and south to Harrison Street. Crossing the main stream, the fire swept the northern division, the finest residence section, to the city-limits. Three and a third square miles were burned over, 17,450 buildings were destroyed, 100,000 people made homeless; and there was a money loss of $200,000,000. Within a year the city had sprung from its ashes and added 50,000 to its population. Its courage, energy and resource amazed an admiring world. In the middle 80's, under pressure of demand for more room in the business

CHICAGO PUBLIC LIBRARY BUILDING

section, the first of the steel-frame, fire-proof sky-scrapers, known as the Chicago construction, was erected. The Masonic Temple, the Woman's Temple and the Auditorium are among the earliest of these tower-like structures now covering the greater part of the central business district. In contrast with these are the low, classic outlines of the Public Library, the Art Institute and several bank buildings. The improvement in domestic and church architecture dates from the World's Fair (1893) and the erection of the many, red-gabled, gray-stone buildings of the university quadrangle on the Midway. In this connection too much can scarcely be said for the influence and benefit of the parks, boulevards and uniformly broad avenues. Lincoln Park on the north shore, Humboldt, Garfield and Douglas Parks on the west side and Washington and Jackson in the

south division are connected with each other and with many smaller parks and open squares by boulevards. Michigan Avenue, Jackson Boulevard and the Lake Shore Drive link the limits with the business section. Extension of Grant Park a mile into the lake, and a shore line parkway, will give Chicago one of the most beautiful waterfronts in the world.

WHAT MADE THIS GIANT CITY

Business is on the same gigantic and aspiring scale as the sky-scrapers, "City Beautiful" plans and the growth in population, which is now approximately 2,500,000. The earliest lines of trade to be developed, when the western limit of commerce was the Mississippi, were grain and lumber. With the spanning of the river by rail and the development of the wheat states of the northwest, the Chicago Board of Trade ruled the grain market. The conquering of the Great American Desert confirmed her sovereignty. Annually the city receives over 35,726,000 bushels of wheat. Receipts of wheat, flour, corn, oats, rye and barley aggregate 332,008,041 bushels. The city has 68 elevator warehouses, with a grain-storage capacity of 46,640,000 bushels. The prairie country's greatest need was for building material. This Chicago supplied from the forests of Michigan and Wisconsin. With the partial exhaustion of these forests Chicago reached more remote supplies. The lumber handled in the Chicago market yearly exceeds 2,642,650,000 feet. The packing industry which began in the 40's, to supply lake-vessels and lumber-camps with salted and smoked meats, received its first impetus from the Civil War, and its second and greater one from the invention of refrigerator cars by which fresh carcasses may be shipped to any part of the world. Yearly the slaughtering and meat packing houses of Chicago turn out products amounting to over $375,000,000 and employ upwards of 27,000 men. The iron and steel industry, which has grown up since the discovery of iron ore in the Lake Superior region, amounts to $135,000,000 (including products of foundry and machine shops); printing and publishing $74,000,000; and the manufacture of clothing, which began in the outfitting of 49ers in the rush for the California gold-fields, turns $85,000,000 into Chicago's pockets every year.

OTHER FEATURES OF HER COMMERCIAL LIFE

The manufacture of electrical machinery alone now aggregates $20,000,000 a year. At the packing houses, the International Harvester works and the plant of the Western Electric Company visitors are welcome and the processes are explained. At the electric works the making of telephones and dynamos is especially interesting and of educational value. The average pay-roll of Chicago manufactories amounts annually to $175,000,000, and in the value of manufactured products Chicago ranks second in the list of American cities.

In the wholesale trade dry goods lead with $200,000,000, produce $160,000,000, groceries $100,000,000, boots and shoes $60,000,000 and the mail order business, which enters all lines, $90,000,000. Manufactured articles are carried chiefly by rail; raw material, such as coal, iron ore, grain and lumber, etc., as largely as possible by water in the six months' open season. Each year more than 6,000 vessels, with a tonnage of 9,470,572, clear in Chicago's two harbors.

PUBLIC OWNERSHIP AND PUBLIC SERVICE

The city owns and operates its waterworks and municipal electric lighting-plants, and has a partnership interest in, and the right to purchase, its street-railway surface-lines. The surface-mileage has trebled in ten years and is now 1,364 miles. The elevated mileage has doubled to 144 miles. The form of government is typical. The departments of police, fire, health, water, etc., are under separate heads, and the schools, library and park systems are managed by boards. The old corrupt system of police-court justice has been abolished and municipal courts established. For the child delinquents and defendants there is a juvenile court in its own building, one of the first in the world. To support the city government with its 191.39 square miles of territory and its 21,000 officials and employees, Chicago has an annual revenue of $52,177,591, on an actual valuation of real and personal property of $2,783,248,476.

More than half of Chicago's population is of foreign birth or parentage. With over 40 nationalities listed by the last census, the Germans lead with 416,000, Irish 215,000, Poles 109,000, Swedes 100,000, Bohemians 76,000, Norwegians 41,000, Italians 26,000.

EDUCATION AND THE ARTS

In many of the 407 school-buildings few of the pupils ever hear a word of English at home. There are 6,740 teachers and 307,281 pupils in the day-schools. In the night-schools are 25,000 more, chiefly foreigners. There are 21 high-schools, four of which are manual training, and a normal college. A down-town commercial college is to be established. The public library has 800,000 volumes for free circulation and reference, with many branch distributing stations. Of the endowed libraries, the Newberry covers history and music; the John Crerar library, science and mechanics; the Chicago Historical Society is the custodian of local history, relics and documents. The Art Institute, which has some notable collections, is free to the public three days in the week, and maintains an art-school.

A GREAT MUSICAL CENTER

In the Thomas Orchestra Hall, Chicago stands alone, among American cities, in the possession of an endowed home for orchestral music; and in the Field Columbian Museum of Natural History and Anthropology, endowed with $8,000,000 by the late Marshall Field, Chicago, has

a great scientific institution that must long eclipse anything of the kind in the world. Besides the University of Chicago, which ranks with the best in the country, Chicago has the Northwestern University at Evanston; Wheaton and Lake Forest Colleges; the Chicago, the Western and the McCormick Theological Seminary; the Armour Institute of Technology; Lewis Institute; Rush Medical College; the College of Dental Surgery; the School of Domestic Science; the Kindergarten College; and many other special schools for higher education. A marked feature of the city's educational and moral life is the many social settlements maintained by the universities and churches. Hull House, established about 20 years ago by Miss Jane Addams, was the pioneer settlement and is to-day the model upon which successful work of this kind is done everywhere in the United States.

There has been no history of Chicago of portable size published. [Kirkland's *Story of Chicago* is a portable history.] Visitors to the city should get a copy of the last annual edition of the *Daily News Almanac* to learn what to see and how to get there.

Few people are aware of the fact that Chicago has a subway of 45 miles—twice as long as that of New York City—in operation. It was begun in 1899 by the Illinois Tunnel Company, under an ordinance which required the overhead telegraph and telephone wires of the down-town or "loop" district to be carried underground. The company was reimbursed for its expenditure of $30,000,000 by permission to use the tunnel for freight-traffic. The roof of the subway lies 24 feet below the surface, beneath the water and gas and sewer mains, and the work of excavation was carried on with no interruption of traffic. In the space of a mile square under the business district, there are now 26 miles of tunnels which intersect at every second block. Connection was made with the six big freight-depots of 25 trunk lines and with the terminal station at Taylor Street and the river. The tunnels are of two sizes—trunk, 14 feet high, branch, seven feet six inches. All are lined with 21-inch cement walls poured on a framework of structural iron. The wires were carried along the walls, a narrow-gauge track was laid and trolley wires dropped from the roof. The cars are open steel-boxes, 12 feet long, of one and a half tons' capacity. In the freight-yards these cars are lifted through shafts, loaded, lowered and sent direct into the warehouses of merchants. If the goods are not required inmediately, they may be stored in one of seven big warehouses at the terminal station. There the cars are hoisted to the top by enormous elevators, and unloaded.

The trains make from 12 to 15 miles an hour and deliver up to 100,000 tons a day. Of coal alone 4,000,000 tons are delivered through the subway to the "loop" district in a year. The system relieves the congested down-town streets of thousands of horses and wagons. Chicago is the only city in the world with a subway system of freight-distribution. Plans are being worked out for a great subway system which is to be built either by the city or by private capital under municipal control. The general plan recommended by the subway commission appointed by the mayor is for a high level subway, as close as possible to the surface of the streets and to be operated by electricity. The estimated cost of the subways themselves is $96,257,000 and the cost of equipment $34,844,000.

**Chickadee,** a modest, little, soft-plumaged gray bird, is a member of the titmouse family. The black-capped chickadee is a permanent resident of the northern states. Its breeding-range is north of the Carolinas to Labrador. It is somewhat smaller than the English sparrow, the upper gray slightly tinged with brown, crown and throat black, with white separating the two blacks; underneath a dingy white. It is a brave little bird, quite unafraid of snow and storm, more common in lower New England in winter than in summer, through wintry weather blithely singing its *chicka-dee-dee-dee* or uttering its high, sweet whistle; and a friendly, tame bird, readily responding to invitation to dine near our windows and doors. It is a valuable friend to man in many ways; as an insect-destroyer it is most diligent, a persistent enemy of the cankerworm moth, destroying both the female and eggs and thus keeping down the numbers of "measuring" or "inch" worms. It eats insects in summer, their eggs in winter. Hodge says that probably no bird possesses a higher economic value than the chickadee. The birds build their nests in holes—a deserted woodpecker's nest, or a knothole or a cavity made by themselves in some decayed tree. The nests are of moss, feathers, wool, plant-fibre, fur or sometimes wholly of short hairs. There are from five to eight eggs, white with sparse markings of purple or brown.

BLACK-CAPPED CHICKADEE

The Carolina chickadee is a southern species, the chief difference from the above being that the southern bird is smaller, its

breeding-range from southern Illinois southward. See Dugmore: *Bird Homes;* Chapman: *Bird Life;* Blanchan: *Bird Neighbors;* Hodge: *Nature Study and Life.*

**Chickahominy** (*chĭk'ȧ-hŏm'ĭ-nĭ*), a river in southeast Virginia, which flows into the James. Part of the region watered by the river was the scene of several battles in 1862 and 1864. Here the river flows through a wooded swamp, a few hundred yards wide. A continuous rainfall floods the swamp and overflows the neighboring bottom-lands. These are crossed by deep ditches, and even when not overflowed are so soft as to be impassable for cavalry and artillery. As a military obstacle, the narrow Chickahominy, with its bordering swamps, was found to be more formidable than a broad river. Here in 1862 were fought the battles of Williamsburg, Hanover Court-House, Seven Pines, Fair Oaks, Mechanicsville, Cold Harbor, Savage's Station, Frazier's Farm and Malvern Hill, and in 1864 the second battle of Cold Harbor was fought.

**Chickamauga** (*chĭk'ȧ-mą'gȧ*), **Battle of,** fought upon Chickamauga Creek, a branch of Tennessee River, between the Union Army of the Cumberland under General Rosecrans and the Confederates under General Bragg, Sept. 19 and 20, 1863. The main battle was opened on the morning of the 19th, the Confederates endeavoring to get possession of the road to Chattanooga. Neither side gained any advantage on the first day, though the fighting was severe. During the night Longstreet joined Bragg. On the 20th the Confederates renewed the attack with great fury. At length, in an effort to strengthen the left, which was hard pressed, and partly through a mistaken order, the Union center was fatally weakened. Longstreet with his veterans charged through the line and drove the right wing in confusion from the field. But Thomas, who was on the left, remained firm and repulsed charge after charge made against him by the whole Confederate army. During the night he withdrew to Rossville Gap. This was a Confederate victory, though of no great advantage to them, as it left Chattanooga, the objective point, in the hands of the Federals. The Union loss was about 16,000; Confederate loss about 18,000.

**Chickasaw Bluffs** (*chĭk'ȧ-są*), **Battle of,** was fought near Vicksburg, Miss., Dec. 29, 1862. General Sherman, who was besieging Vicksburg, endeavored to attack the city in the rear. He sent a strong force up Yazoo River, which was to land and march down from the north. In the line of the march was the Chickasaw bayou, bordered by a broad, miry swamp, almost impassable, and guarded by batteries and rifle-pits on the opposite bluffs. Though the head of the charging column reached the works, the heavy fire forced it back and the enterprise was abandoned. The Union loss was about 1,900, while the Confederate loss was very small.

**Chickasaws,** a tribe of Indians, found by the whites about 160 miles east of the Mississippi. De Soto visited them, but when he sought to force them to carry his baggage, they attacked him, causing great loss. In the French-and-Indian wars, the Chickasaws were between the English and the French settlements, and thus came into the struggle between the two nations. They uniformly sided with the English, stirring up the Natchez against the French, and, when that tribe was almost destroyed, joining them in their desperate raids. In 1793 they joined the whites in the war against the Creeks. At the beginning of the 19th century some of the tribes left for Arkansas in search of better hunting-grounds. In 1822 those left in Mississippi, numbering 3,625, settled in eight towns, owning slaves and selling cattle and hogs to the whites. In 1834 they sold their lands to the government and removed west of the Mississippi, buying lands of the Choctaws, who spoke the same language. In the Civil War they joined the south and lost many of their braves, besides, of course, losing their slaves. They no longer have a king, but have a governor, together with a senate and house of representatives. They own their land in common, but each man's stock is his own. They receive an annuity of $3,000, and have in the hands of the government $1,400,000 in bonds, of which they receive the interest.

**Chickasha,** a city, county-seat of Grady County, Oklahoma. It is the trading-center of a fine agricultural region and an important shipping-point for cotton. Chickasha has a flour-mill, a broom-factory and cotton-gins, and the Rock Island car-shops and round-house are located here. It has four banks, good public schools, a convent, library and several churches; also the service of two railroads. Population, 10,320.

**Chic'opee, Mass.,** a thriving manufacturing town on the Connecticut River, at the mouth of the Chicopee, four miles north of Springfield, Hampden County, Mass. It possesses excellent water-power for its industrial establishments, which include the manufacture of cotton, knitted goods, knitting machines, bicycles, rifles, shotguns, pistols, mechanic's tools and agricultural implements. It has a number of good schools, churches and a convent, with several substantial banks. Chicopee Falls are in the neighborhood. Population, 30,000.

**Chignecto Bay** (*shig-nĕk-tō*), an inlet at the north end of the Bay of Fundy. It separates Nova Scotia from New Brunswick. It is 30 miles long by eight miles in breadth. There is an isthmus only 14 miles wide between it and Northumberland Strait in the Gulf of St. Lawrence.

**Chi-hoang-ti,** one of the greatest emperors of China, who ruled from 246 to 210 B. C. It was he who, by his military successes, formed the eight kingdoms then making up China into one great empire. He further extended the empire so that under him it came to be about as large as it is now. He was also the builder of the great Chinese wall.

**Chihuahua** (*chē-wä'wä*), the largest state of Mexico, adjoining New Mexico and Texas, covers 87,802 square miles and is about as large as Idaho. In the east is a large desert of sand; the south and west are mountainous; and there are many rivers. Its silver mines were for centuries the richest in Mexico. Its capital, Chihuahua, rises like an oasis in the desert among roses and orange-groves. Founded in 1691 it housed a hundred years ago 80,000 people. Population of the state, 405,265.

**Child, Lydia Maria,** American author and, with Wm. Lloyd Garrison, a zealous advocate of slavery abolition, was born at Medford, Mass., Feb. 11, 1802, and died at Wayland, Mass., Oct. 20, 1880. Early in the thirties, some few years after her marriage, she and her husband (David Lee Child) took an active interest in the subject of American slavery, against which she made many stirring appeals, both in her novels and in a periodical which she afterward edited, the *National Anti-Slavery Standard.* Her writings greatly contributed to the formation of public opinion adverse to the holding of slaves; while she aided the cause she had at heart by supporting schools for the negroes, helping freedmen and giving of her bounty to the Union soldiers in the Civil War. Her writings include *The Rebels;* a novel, *Hobomok; Fact and Fiction; The American Frugal Housewife; Looking Toward Sunset* and *The Progress of Religious Ideas.*

**Child-Study.** Early philosophers and psychologists, notably Plato and Aristotle, have occasionally commented on phases of child-life, but the systematic study of the mental and physical nature of children has been reserved for modern and, indeed, quite recent times. The subject was first approached from the point of view of the educator. Among many others Comenius, Rousseau and Pestalozzi were strenuous in insisting on the vital importance of a study of children to the one who expects to teach them. All these writers emphasized the need of beginning education with an appeal to the senses. Only in this way, they declare, can the reason and the judgment ultimately be reached. Rousseau, the enthusiastic advocate of nature, was especially interested in the child, at any rate in the theoretical child, as one expressing the purely natural in its naïve spontaneity. He would have the education of the child consist largely in permitting it to develop in a natural and untrammeled way. This idea, antagonistic to the earlier religious one of the total depravity of the child, was, in spite of some limitations, the inspiration of the greater part of modern educational reform.

Herbart, whose educational theory turns about the notion of apperception (q. v.), requires of a teacher a very careful study of the contents of the child's mind and also of those diseases, temperamental variations and emotions that are likely to interfere with successful learning. It will be noticed that he does not advocate child-study as a means of discovering those instincts, the proper development of which constitutes the aim of education. This point of view, suggested by Rousseau, it was left to Froebel and more recent students of children to develop. On the other hand, Herbart did point out the great importance of studying the minds of children and of men by observation and experiment instead of by introspection and speculation. This improvement in method has been responsible for a large part of the results of recent child-study.

Froebel derived is view of the aim and material of education from his sympathetic philosophy of the nature of the child. From the point of view of the development of child-study, his most interesting conception is that the child in his evolution passes through or recapitulates the same series of steps that has been traversed by the race in its evolution. This idea was not original with him but was derived on the one hand from philosophers like Lessing, who were emphasizing, as against Rousseau, the value of historic culture to the individual, and on the other from biologists like Von Baer, who had discovered that the embryo of any higher type of animal passes through stages in which it resembles the embryos of lower types down to the very simplest. This notion of recapitulation has been applied to education in two forms. The first is that of the culture-epoch theory, developed by Ziller, one of the followers of Herbart. According to this view the course of study should be so arranged that the child will first take up the study of primitive life and culutre, and then deal successively with more and more advanced types of civilization. Courses of study arranged on this plan were expected to appeal most successfully to the interests and powers of the child. This contention has not been entirely justified, but the culture-epoch theory remains to-day a most valuable clue to the interests of children. The second application of the theory of recapitulation to education is found in the notion that the various instincts appear in the child in much the same order that they

appeared in the race. At first very imperfectly developed, they require education for their perfecting, but the satisfactory maturation of the child requires that each should be allowed to run its course, so that the properly developed child has run the gamut of ancestral interests. This idea may be said to represent fairly well the belief of the very influential group of child-psychologists who follow President G. Stanley Hall of Clark University. Both applications of the idea of recapitulation to education are liable to the criticism that, while they suggest what is interesting and can be taught to the child, they do not enable us to know what should not be taught. Many stages of culture need not be represented in the child's education. So, too, many instincts, as those of fighting, may need repression rather than development.

The method of careful scientific observation of the child recommended by Herbart finds its earliest and best exponent in the German physician and psychologist, Preyer. In his book, *The Soul of the Child*, we find a most careful study of the development of the powers of sense, or the feelings of physical and mental control, of language and the logical processes and self-consciousness. Space does not permit the statement of detailed conclusions, but the most suggestive and interesting outcome of Preyer's investigation is the clearness with which he puts the fact that the child at birth and for many months thereafter is not only without self-consciousness, reason and will, but that even its sense-perceptions are vague, confused and undifferentiated. Feeling is at first the mere rude sense of discomfort or comfort. The eyes are uncoördinated, the gaze is not fixed, and objects are not clearly discerned, not to speak of distances and colors. The same general condition holds of hearing and touch and even taste and smell.

The clarifying discoveries of Preyer have stimulated much valuable research into the methods by which self-control, judgment and conscience are evolved from the primitive chaos and night of the infant's consciousness. The most important development in this field takes the form of a psychological reinterpretation of the old principle that learning should be by doing. As stated by the American psychologists, Professors Dewey and Angell, who merely represent here the point of view of the psychology of to-day, consciousness arises when the child is stimulated more or less uncomfortably by some object, say a rattle. It reacts in a variety of movements, partly reflex, partly random in character. Among these movements one is usually more satisfactory in its results than the rest. Assumie t to be that of grasping the rattle. This comes in the course of time to be the one movement that follows from the given stimulus, and the other unsuccessful movements are gradually eliminated. While this process is going on, the mind is gradually growing familiar with the stimulating object and is distinguishing those characteristics by which it can be identified. Thus perception is developing. The child becomes conscious of what the object is and what it means. It then is capable of acting toward this object with intelligent foresight into consequences, that is, it can will. In a similar way all the mental powers develop. We learn to perceive, to remember, to imagine and to reason because we react toward stimulating objects, and in order that we may react more successfully. Consciousness finds its stimulus in an unsatisfactory situation and its function in assisting to a satisfactory treatment of this. To get a pupil to learn, the teacher must get him to be discontented with his capacity to do. This will stir up a process of experimentation, in the course of which the powers of thought and feeling will expand.

The typical experimental activity through which a young child learns most has been recognized to be that of play. According to Professor Groos, play is simply the expression of the instincts of the child and so of its interests and capacities. This activity is accordingly justified in the place assigned to it in education by Froebel. It must, however, be led into work by methods that are indicated in the article on INTEREST. One important activity by which this transition between the imperfect, instinctive plays of the child and mature efficiency is effected is found in imitation. This process has been exhaustively treated by the American psychologist, Professor Baldwin, who finds in it the means by which the child is led to become conscious of himself and of others, and so to develop his social and ethical nature. In the endeavor to imitate the child becomes adjusted to society.

The great emphasis thrown by child-psychologists upon the feebleness of intelligence and the imperfection of instincts in the infant naturally rouses our curiosity as to why the young of brutes should be so much more capable of helping themselves. Mr. Fiske, the American historian and philosopher, has found in the helplessness of infancy the secret of man's capacity to learn. A brute is fairly well-fixed in its mode of life by its instincts. It does well in commonplace situations, but in unusual emergencies it is helpless. Its life is, however, as a rule, simple and commonplace It does not need to do new things. Man, on the other hand, is in his complex life continually compelled to learn, to readjust himself. Hence he is born helpless, with imperfect instincts

and a corresponding enormous capacity to learn.

In recent years the child-psychologists have devoted much attention to the special features of the age of adolescence. This subject is treated in another article. Another important field is the study of the physical development and health of the child. Much information of the greatest value to teachers has come from these investigations.

See APPERCEPTION, INTEREST, ADOLESCENCE, METHOD OF TEACHING, MODERN EDUCATION, PSYCHOLOGY FOR TEACHERS, SELF-ACTIVITY.

Consult Preyer: *The Senses and the Will* and *The Development of the Intellect*, Appleton & Co.; Kirkpatrick: *Fundamentals of Child Study*, the Macmillan Co.

E. N. HENDERSON.

**Child-Labor Laws.** So long as a young apprentice lived in the family of his master, the evils of child-labor do not appear to have been great. But when, at the end of the eighteenth century and the early part of the nineteenth century, children came to be employed in large factories, at a very early age, for very long hours and under a brutal discipline and most unhealthy conditions of work, laws became needful to restrict the abuse of child-labor. Both the need and the laws came earlier in England than in the United States. Probably no man did so much on behalf of the factory-acts as did Lord Shaftesbury. In 1802 the hours of apprentices were limited to twelve, no part of which must fall between 9 P. M. and 6 A. M. In 1819 was passed an act that no children under nine years should be employed in the cotton-mills, nor should their hours be more than twelve per day. In 1831 night-work in cotton-factories was prohibited for persons between the ages of nine and twenty-one years. In 1833 night-work for young persons was prohibited in most other mills. In 1847 came the ten-hours bill, which limited the work of women and children to ten hours per day. In 1899 the Elementary Education Act raised the age at which a child might leave school from eleven to twelve years. An act of 1901 summed up the results of the factory-acts and allowed no children under the age of twelve to be employed in factories.

Until recently in the United States, each state made its own labor laws, and as a result a few backward states had no child-labor or even compulsory education law.

The most important legislation in the history of child-labor was the act passed by Congress in 1916, excluding from interstate commerce, articles from factories where any child under fourteen years of age is employed or where any child under fifteen has worked more than eight hours a day or been employed at night. The chief difficulty in protecting children had previously been that humane manufacturers who did not wish to employ children were compelled to compete with manufacturers in other states who did employ them and so made goods at less cost.

**Childs, George William,** an American publisher, well-known for his generous gifts to charitable and public causes. He was born at Baltimore, Md., in 1829. He came to Philadelphia at an early age, and about the year 1849 became a member of a publishing firm afterward known as Childs & Peterson. In 1864 he became owner of the *Public Ledger*, which he made a great success. His philanthropy took many and varied forms, at one time establishing a home for aged printers; at another commemorating authors, like Geo. Herbert and Wm. Cowper in Westminster Abbey and erecting to Shakespeare's honor a memorial fountain at Stratford-on-Avon. He died at Philadelphia, Feb. 3, 1894.

**Chile** (*chil'e*), a republic of South America, has been called the shoestring republic from its peculiar shape. It is a narrow strip of territory thirty times as long as it is wide. It is nearly 3,000 miles long with an average width of less than 90 miles. For comparison conceive a strip of territory as wide as from Chicago to Milwaukee and as long as from New York to San Francisco. It stretches from Peru on the north to the extreme southern limit of the continent, with Bolivia and the Argentine Republic on the east and the Pacific Ocean on the west.

*Surface and Climate.* Chile has an area of 292,580 square miles, about five times the area of New England, with a population in 1910 of 3,329,036, about two-thirds the present population of New York City. Chile is a mountainous country, carrying two parallel ranges through most of its length. A narrow strip along the coast slopes up to the western Cordilleras. Between this range and the great Andean range, which forms the eastern wall of Chile, lies the great central valley, with a length of 581 miles and an average width of 31 miles. This valley has a rich, productive soil and contains the most important cities and towns. More than one fourth of the territory of Chile lies above the snow-line. In the western Cordilleras range are found the snow-capped peaks of Tacora 19,800 feet; Huallatire 19,720 feet; Parinacota 20,950 feet; In the main Andean range are Copiapo, a volcano, 20,022 feet; Nevada Los Leones, 19,850 feet; Cerro Jotabeche, 19,259 feet; Cerro Volcan, 18,341 feet; and on the boundary between Chile and Argentina, Tres Cruces 22,213 feet; Cerro Incahuasi 21,576 feet; Los Patos 20,595 feet; and many others from 18,000 to 20,000 feet high. A number of islands belong to Chile, the most important being Chiloe, Juan Fernandez and a part of Tierra del Fuego.

*Climate.* The seacoast on the west and the mountain range on the east afford conditions which render the climate of Chile healthful. The temperature varies from 67° in the north to 43° in the south. It averages about 6° lower than on the eastern coast of South America, owing to the Antarctic current, which flows along the western coast, and to the Andes which shut off the warm winds from the eastern plains. The northern section is tropical, and, being subject to the dry southeast trade-winds, is practically rainless. The central division has a temperate climate and a rainfall during the winter, with dry summers. In the southern section the rainfall is heavy, averaging 115 inches annually.

The rivers of Chile, of which there are a large number, have their rise in the Andes and empty into the Pacific, and for the most part are short shallow streams.

*Cities.* Santiago, the capital of Chile, is the third largest city in South America, population, 332,724. Valparaiso, the chief port on the western coast of South America, is 62 miles west of Santiago, population 162,447. Iquique, celebrated as a nitrate port, has a population of 42,488. Other cities are Concepcion, population 55,330; Talco, population 38,040; Chillan, population 33,506; La Serena, population 15,996; Curico, population 17,573; Antofogasta, population 32,496; Talcahuano, port of the city of Concepcion, population 15,561.

*Resources.* It is a noteworthy fact that the barren, rainless section in the north of Chile is the chief source of the nation's wealth. The export of nitrate from this region amounts to over $43,000,000 annually, being more than two-thirds of the total exports of the country. The nitrate produce of 1910 was 5,078,133 tons. Other mineral products, copper, silver, gold, iodine, with leather, wool, hides, etc., bring the total exports up to $125,000,000. Agricultural products, while large in the aggregate, are not sufficient for the needs of the country, so that imports of food amount to six millions annually.

*Railways.* There were 3,573 miles of railway open for traffic in 1911. The Central system, a trunk line owned by the government, traverses the central valley with branches to coastal and interior points. A branch connects with the Transandine Railway, completed in 1910, which furnishes all-rail connection with the Atlantic coast at Buenos Ayres, a distance of 880 miles from Valparaiso.

*Government.* Chile is a republic, consisting of twenty-three provinces and one territory. The president is elected for a term of five years and is not eligible for a second term. He is assisted by a council of state composed of eleven members, six of whom are elected by Congress and five are appointed by the president. There also is a cabinet of six ministers who are appointed by the president, with the approval of the senate. There is a national congress consisting of a senate and a chamber of deputies. The chief executive of each province is an intendant appointed by the president.

*Education.* A system of public schools is maintained by the state. In 1910 there were 2,716 public primary schools with 258,875 pupils, beside 506 private primary schools with an attendance of 66,577. There are two universities, one belonging to the state, with an attendance of about 3,000. There are lyceums and colleges in the capitals and provinces, including four for girls in Santiago and 11 in other towns, with 2,500 students. There are three normal schools for men and three for women, with an aggregate attendance of 2,222. There also are schools of mining, private secondary schools, agricultural and other special schools.

*History.* The northern part of Chile belonged to the Incas of Peru; the southern part to the Araucanian Indians, the only tribe unconquered by the Spaniards, and who, until lately, kept themselves independent of Chile. The first European to land in the country was the Portuguese discoverer, Magellan. He reached Chile in 1520, just after his famous voyage through the strait that bears his name. Pizarro's lieutenant, Almagro, headed an expedition southward from Peru in 1535, and another expedition, under Valdivia, founded Santiago in 1542. Chile declared herself a republic in 1810 and revolted from Spain, under the leadership of Don Bernardo O'Higgins, her first dictator. The constitution was adopted in 1833.

Chile's war against Peru and Bolivia arose over boundary-disputes with Bolivia. No sooner was war declared against Bolivia, in February, 1879, than Peru avowed a secret treaty, offensive and defensive, made six years before, between herself and Bolivia; and as a result, she bore the brunt of the war. Chile overwhelmingly defeated the allies. In the battle of Iquique, May 21, one of Peru's four ironclads was sunk on the rocks; and at the battle of Cape Augamos the capture of the ram *Huascar* left Chile master of the sea. The invasion of Peru followed, 10,000 Chileans routing 20,000 allied troops at Dolores, November 2. The doubtful battle of Tarapaca, a week later, was followed by a retreat of the Peruvians. Early in 1880, 14,000 Chileans won a third battle, north of Tacna, after a hard march across the desert and still harder fighting. At last, after two well-fought battles, at Chorrillos and Miraflores, the Chilean army of invasion entered Lima, Jan. 18, 1881. The little republic has since passed through a revolution, brought about by the unlawful use of power by the president or, rather, dictator, Balmaceda. The law-abiding party or congressionalists were successful, Balmaceda committing suicide after all hope was lost. In 1891 an at-

tack upon American sailors in the streets of Valparaiso came near to bringing on a war with the United States.

**Chil'lico'the, O.,** an attractive city and railroad center, the capital of Ross County, Ohio, situated on the Scioto River, 50 miles south of Columbus and 100 miles east of Cincinnati. The B. & O. S. W., Norfolk & Western, C., H. & D. and Scioto Valley railroads traverse the town. At the beginning of the last century, it for a decade was the capital of Ohio. It possesses some fine public buildings, including schools, courthouse and public library. Its manufactories include paper mills, flour mills and the manufacture of carriages, shoes and farm implements. Population, 15,500.

**Chil'koot Pass.** This pass is in eastern Alaska, on the trail leading from Lynn Inlet and the ports of Dyer and Skagway, to the gold fields of the Klondike and other interior points. It starts in Alaska, but the highest point is just over the Canadian border; and here the British have their custom-house. There is a cable which pulls up the loads of the intending miners at this point. The varied types of humanity and the presence of a custom-house in this wild spot amid the snows give this port a picturesque character of which many have written.

**Chimborazo** (*chĭm'bō-rä'zō*), a peak of the Andes, in shape like a cone, lying in the republic of Ecuador, 20,517 feet above the sea. It was for a long time thought to be the highest mountain-peak in the world, and its snowclad top was named the Silver Bell. The mountain was first scaled by Whymper in 1880.

**Chimera** (*kĭ-mē'rȧ*). A chimera is a monstrous or vain fancy. The chimera of mythology was a monster, its front like to a lion, behind a serpent, and in the midst of it a goat. This fire-breathing monster was slain by Bellerophon. It is thought to have stood for a volcano, on whose crags were lions and on its rocky sides goats; while at its foot would dwell the serpents of the marshes. Bellerophon, then, would have subdued it by making his home upon its forbidding slopes. Hesiod gave the chimera the heads of a serpent, a lion and a goat. There is a family of shark-like fishes now known to scientists as *Chimæra.*

**Chimney-Swift,** mistakenly called chimney-swallow, is not even distantly related to the swallow, its stiff, mechanical flight being wholly different from that bird's graceful motion. If not characterized by grace, the flight is very swift and is long sustained, and the bird is well-named the swift. It is said it can travel 1,000 miles in twenty-four hours, stopping only to roost in occasional tree or hollow chimney. The bird does not perch, but clings to a rough surface by means of sharp claws and sharper tail. Its nest, built in an unused chimney, seems more like a shelf than a nest. It is almost flat, and is woven entirely of sticks fastened to the wall by a sort of glue that flows from the mouth during the breeding season. This glue becomes hard and very strong, and the nests are fastened most securely, though, as is well known, a sudden fire in the chimney brings disaster. The four to six eggs are white. With beak and feet the bird, while in flight, breaks off sticks for the nest, and while in flight feeds, going through the air with mouth wide agape—as do its kin, the nighthawk and whippoorwill, and as does the swallow. Swifts rid the air of gnats and mosquitoes; they travel in the late afternoon and early morning. In color they are a sooty gray. The birds breed from Florida to Labrador and west to the Great Plains, are common summer residents and migrate in April, September and October. See Dugmore: *Bird Homes;* Blanchan: *Birds Every Child Should Know.*

**Chimpanzee** (*chĭm-pan'zē*), the best known of the man-like apes, because often seen in captivity, while its nearest relative, the gorilla, is practically unknown outside its natural haunts. It is also related to the orang-outang. It lives in the dense forests of Africa, on the coast of Guinea and in the heart of the continent as far north as the Sudan. It is of black color, with a broad, leathery, reddish-brown face, and attains a height of four or even five feet. It has no tail, and its arms, although long, are not so long in proportion to its body as those of the orang-outang. Its life is largely spent in the trees; when on the ground it often stands upright, and in walking places the knuckles of its hands on the ground, but the legs are bent and there is a forward stoop, so that the chimpanzee does not show its full height when walking. The chimpanzees, like other apes and monkeys, are great imitators, and show considerable intelligence and judgment. In their forest home they feed on berries and other fruits; cultivated bananas are also stolen, and on this account they are hunted by the natives. See Apes.

CHIMPANZEE

**China Sea, The,** is chiefly known to American boys as the scene of terrible adventures with Chinese and Malay pirates and of the destructive work of typhoons. It is destined, however, to be one of the most important seas in the world. It is enclosed by the Malay Peninsula (British), French China and China proper to the west; to the north by the

Straits of Formosa; to the east by Formosa (Japan), the Philippine Islands and Borneo (British); to the south by the Java Sea. Hence it is girt by British, French, Chinese, Japanese and American dominions, countries that will no doubt develop into centers of civilization and wealth in days soon to come. East China Sea lies to the north of Formosa, being partly shut off from the Pacific by the Liu-Kiu Islands, a possession of Japan.

**China-Ware,** a species of fine porcelain, originally manufactured in China (whence its name). It is characterized by the fineness of its texture, transparency and beautiful color. It is made from two kinds of earth, known as petunse and kaolin, which are worked into a white paste, the kaolin enabling it to withstand great heat in the furnace; after this the article, cup, vase or whatever it may be, passes into the hands of the painters for decoration and delicate coloring, when it is then glazed or varnished, and once more submitted to the furnace to have the colors burned in and given their rich luster. China-ware has been manufactured more or less successfully in Europe. The fi est imitations are those known as Sèvres, Dresden and Wedgwood or queensware. The French have turned out some beautiful china, which they call *faïence fine*, or Henri II ware; but the most artistic, probably, is Sèvres, manufactured in that town, in France, together with the Dresden ware manufactured in Saxony. The most notable English ware turned out has been that of Josiah Wedgwood, whose classical vases, ornamented by the sculptor Flaxman, attained great repute and command high prices. The Japanese have also reached great perfection in the manufacture of porcelain; the Hizen or "old Japan" ware being noted for its elegance and beauty of color.

**Chinch-Bug,** an insect very destructive, especially to corn and wheat. It is estimated that the loss from this pest—mainly in the Mississippi valley—has amounted to $60,000,000 in a single year. It is a true bug—having a sharp beak, instead of jaws, with which it punctures the grain and sucks the juices. The plants are not eaten but sapped of their life. The chinch-bug is a small bug about one sixth of an inch long, blackish in color, with snowy white wing-covers marked with a dark spot and line.

**China.** Its boundaries now embrace China Proper, Manchuria, Ili (including Sungaria and East Turkestan) and Tibet, and also a wide territory in eastern Asia. According to recent Chinese estimates the following is the area and population of the republic: China Proper, 1,532,420 English square miles; population, 433,553,030. In 1904, however, Mr. Rockhill, American minister to China, after careful inquiry concluded that all official estimates since 1750 have far exceeded the truth and that probably the inhabitants of China Proper number less than 270,000,000. The dependencies are Manchuria, area 363,610 English square miles and the population 16,000,000; Tibet, area 463,200 English square miles and 6,500,000 population; and Chinese Turkestan containing 550,340 English square miles and 1,200,000 population. Mongolia, part of which is now independent, has an area of 367,600 miles, population, 2,600,000. The natives call their country the Flowery Kingdom or the Middle Kingdom, while the name Cathay came from the Persians. The name China comes from India.

*Surface and Drainage.* China Proper slopes from the mountainous regions of Tibet and Nepal toward the eastern and southern shores of the Pacific. The Nang Ling or Southern Range, a spur of the Himalayas, is the most extensive mountain range, separating southeastern China from the rest of the country. North of this long range, as far as the Great Wall, lies the Great Plain, covering 210,000 square miles, on which live 175,000,000 people. The soil of most of it, called loess beds, is a brownish earth, crumbling easily between the fingers. It covers the subsoil to a great depth, and is apt to split into clefts. These clefts afford homes for multitudes of the people, who live in caves dug at the bottom of the cliffs. Sometimes whole villages are so formed, in terraces of earth which rise one above the other. These loess beds are very rich, and have given to the province of Shan-hsi the name of the Granary of the Nation. The two largest rivers are the Ho or Yellow River and the Yang-tze-Chiang, each over 3,000 miles long. Ho has changed its course many times, and its numberless floods have given it the name of China's sorrow. It last burst its banks in 1887, destroying millions of lives. The Grand Canal, built by King Kublai, joins the northern and southern parts of the empire and is over 600 miles long. The Great Wall (see adjoining article) is 1,500 miles long.

*Cities.* The nominal capital is Pekin, in the province of Chili, population estimated at 700,000, part of which reside in the Chinese city and part without in the Tartar city. The other chief cities, with their estimated populations, are Canton (1,250,000), Tientsin (750,000), Shanghai (651,000), Hankau (870,000), Ningpo (400,000) Fuchau (624,000), Nankin (270,000) and Chung-King (620,000). Hong-Kong (population, 366,145) is a crown-colony of Great Britain, ceded to that power in 1841.

*Resources and Exports.* China's coal-fields are extensive, coal being found in all of the 18 provinces, but chiefly so far in Shansi, Feng-tse, Kai-Ping, Pashan, Annan and Kansu. Tin, copper, lead, silver and gold are found, but very little has been done in the way of mining. China's imports in 1910 were in value about $310,000,000, while her exports were $155,000,000. Silk,

raw and manufactured, raw cotton and tea, were among the chief exports. In 1910 the value of Chinese exports to the United States amounted to $31,297,928, while the imports from the United States amounted to nearly $17,000,000.

*Agriculture.* China is a farming country. Each year the emperor began the season by himself turning over a few furrows in the Sacred Field, while the empress in the same way started the work among the silkworms, the care of which is left to the women. Wheat, corn and other grains, peaches, pineapples and other fruits, sugar in Formosa, rice, and opium are grown; but tea and silk are the great export crops. Pork is largely eaten, though ducks and geese, fish, caught by tame cormorants (which see), and dogs are also used as food. The famous bird's-nest soup is made by slicing the nest into soup, thus adding an invigorating quality. The great beverage is tea, which is drunk weak and clear, and is offered to guests at all hours of the day. It is this tea-drinking habit which has made the Chinese a temperate people, a drunken man being a rare sight. The Chinese clothing is made from their stores of silk, cotton and linen. China is the home of silk; the mulberry grows everywhere, and the silkworm has been cared for since the 23d century B. C. The manufactured silk ranks as high as any made in Europe, while the embroidery is superior to that of the west. Cotton is also now raised everywhere.

*Customs and People.* For building, the Chinese use timber, brick and stone; but cheap houses are made of a kind of concrete called sifted earth. The best architecture of the country is seen in the marble bridges and altars of Pekin. In the country, houses are rarely over one story high. In the cities, the highest buildings are the pawnbroker's shops, and the most finely finished are the guildhalls of the trades. The pavilions and pagodas are picturesque. The streets of the cities are usually not wider than lanes; they are paved with slabs and are badly drained. Matting on the floor, tables and straight-backed chairs, sometimes a bamboo couch and stools, make up the furniture of the houses. The dress of both sexes is much the same. The most striking thing in the appearance of the men is the queue, a plat of hair which hangs pendant from the crown, all the rest of the head being shaved; while among the women the most notable thing is their small feet. This is a late and foolish fashion, prevalent only from the 6th century A. D., and is not customary among the very poor or among servants. It is effected by bandaging the feet in early years so as to prevent further growth. The Chinese girl at ten years is shut up in the women's apartments, and is taught the care of cocoons, silk weaving and all woman's work. At 15 she wears the hair-pin to show that she is now a woman. Marriage is controlled by the parents, and a class of match-makers or go-betweens has arisen, who hunt up desirable matches for parents. The killing of girl-babies was formerly practiced; but only among the lower classes, and then the reason was poverty. The complexion of the Chinese is yellowish, the hair coarse black, the eyes seemingly oblique, cheek bones high and face roundish. They usually are stout and muscular, temperate, industrious, cheerful and easily contented. The dead are buried in graves built in the form of mounds or cones. There is no weekly day of worship and rest, like our Sunday, but festivals are many. New Year's Day is the one holiday for all. On this festival the noise of fire-crackers is to be heard everywhere; the people dress in their best; the temples are visited; and the gambling tables are surrounded by crowds. Other festivals are those of Lanterns, Tombs, Dragon-Boats and All Souls.

*History.* The Chinese are a very ancient race, their annals going back to 2637 B. C., though there probably were Chinese living in the country long before that. China as an empire dated from 221 B. C., and lasted for over 2,100 years. The late dynasty, the Manchu-Tartar, began to reign in 1643. The Chinese were not the first people in China. They made their way from the north and west, pushing before them the older inhabitants. However far back you go, you always find two persons of prominence in China—the ruler and the sage. The sage, or Man of Intelligence, advised and helped the ruler, and taught the people lessons of truth and duty. From this grew up the custom, in full force since the 7th century A. D., that all officers of the government must be educated. This is now done by competitive examinations. The three religions of China are Confucianism, representing the brains and morality of the nation; Taoism, its superstitions; and Buddhism, its worship and idolatry, though it acknowledges no God. China, before the republic, was governed by the emperor through the grand cabinet, which met daily for business between 4 and 6 A.M. Seven boards—civil office, revenues, ceremonies, war, punishment, works and foreign affairs—prepared the matters which were to be dealt with by the grand cabinet. The provinces were governed usually by a viceroy acting for the emperor. The rank of the different provincial officers was indicated by a knob or button on the top of their caps. The revenue of the empire was under $100,000,000. The imperial army was about 200,000 strong, with headquarters at Pekin, and scattered in garrisons throughout the provinces as far as Turkestan. There were also some 700,000 militia troops, called the

national army. The navy after the war with Japan did not number more than a few small cruisers and several old torpedo-boats. China has never cared to have anything to do with western nations, but has been forced to do so. In 1516 the Portuguese, followed by the Spaniards, the Dutch and the English, appeared at Canton. In 1767 sprang up the opium-traffic. It was the traffic in this drug that brought on the war with England in 1840 and the war with England and France in 1855-57. By these wars China was forced to cede the island of Hong-Kong to Great Britain, to open many of its ports to trade and to let in missionaries and admit opium. It has recently been semi-officially announced that the importation of opium will after the lapse of a few years be prohibited.

On Feb. 24, 1844, Caleb Cushing arrived in China and negotiated the first treaty between that country and the United States. The late emperor came to the throne as a child of four years old. He became king in his own name in 1887; though in 1898 an imperial edict announced that the empress-dowager would direct the affairs of the empire. Of late years the Chinese have shown a tendency to seek a livelihood abroad, especially in California, British Columbia, the Straits Settlements, the East Indies and Australia. Chinese workmen or coolies began to come to the United States about the time of the discovery of gold. In 1882, 33,614 came. The low wages at which the coolie was willing to work threatened to destroy the high wages of American laborers; and this led to action by Congress prohibiting their immigration to the United States, although permitting Chinese merchants and students to travel or live in the country. British Columbia and some of the Australian colonies have also passed similar exclusion-laws. In 1894 China became involved in war with Japan, the result of rival interests in Korea. She, however, proved no match for Japan on land or sea. Her armies were routed and her fleet destroyed, and in 1895 she secured peace by the payment of a heavy war-indemnity and the cession to Japan of the island of Formosa. Of 34 ports open to foreign trade, only 7 have less than 20,000 population.

The very symbol of the "unchanging East" in her intense conservatism and apparent indifference to the movements of the world beyond her boundaries, her own easy and swift defeat by Japan and the subsequent victory of Japan over Russia produced a profound change in China and the mental attitude of the Chinese people. It convinced the leaders of national thought of the utter incompetence and corruption of their Manchu rulers and of the superiority of Western education, military and industrial methods and ideals. The more intelligent among the Chinese began, through these leaders, to demand better government, the right to take part in it, the increase and modernization of the army, the substitution of European for Confucian subjects in the Civil Service examinations and the establishment of schools similar to those of America and Europe.

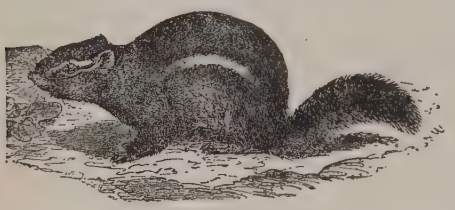
Alarmed by these rumblings of the gathering storm, the government began the usual process of making pretended concessions. Late in August, 1908, an imperial decree announced that nine years from date—that time being required to fit the people for the proposed measure of self-government—a parliament and constitution would be granted. This failing to quiet popular discontent, another edict, three years later, provided for a cabinet and council to assist the emperor, but a president under the control of the throne was given the right of veto over other members. Exasperated by the delay in establishing real constitutional government, the people rose in various parts of the empire until the uprising assumed the form of a general rebellion and within a few months had become a revolution. Beginning in September, 1911, it was practically ended by December, and on December 29 Dr. Sun-Yat-Sen, who was educated in America and who had been particularly active in the campaign, was elected president of the "Provisional Government of the United Provinces of China." The child emperor, Pu-Yi, through the regent, abdicated, and on February 12 issued a proclamation which closed the 267 years reign of the Manchus and established the Chinese republic. The premier of the empire, Yuan-Shih-Kai (*Yōō-ān' shē ki'*), was chosen president. Dissensions, particularly over the finances, arose between the new president and the council and Yuan-Shih-Kai made himself emperor. He died shortly after and Si-Yuan-Hung, the former vice-president, became president. The first nation to take official notice of the establishment of the republic was the United States, which by concurrent resolution of Congress extended congratulations to the people of China. William J. Calhoun, our minister to China during her revolution, says: "The Chinese republic is, of course, not up to our standards, but that cannot be expected. The great mass are ignorant, living in mud-walled houses without windows or doors, but they are a peace-loving, industrious people and the whole impulse of China is toward modern education. In this the missionaries are doing a wonderful work."

**Chinese Wall, The.** The construction of this great feature of the Middle Kingdom was finished in 214 B. C., as a grand barrier along the north of the Chinese empire. It is 1,500 miles long, and is constructed of two strong retaining walls of brick, rising from granite foundations,

the space between being filled with stones and earth. It is about 25 feet broad at the bottom and 15 feet at the top, and from 15 to 30 feet in height. The top was at first covered with bricks, but is now overgrown with grass. The wall took ten years to build, and it is said that several millions of workmen were employed on its construction.

**Chinooks** (*chĭ'nookz'*), a tribe of Indians who formerly lived on both banks of the Columbia River, broken into many bands. Their language differed somewhat among different bands, and was hard to pronounce. This led the traders to use what was called Chinook jargon, containing some Chinook words, togther with French, English and words from other Indian languages. There are only a handful of Chinooks left, who are on the Chehalis reservation in Washington.

**Chipmunk,** a very wide-awake, sun-loving small squirrel that lives on the ground. It is sometimes called the striped squirrel, the black and light-colored stripes on its gray-brown fur being very prominent; a narrow black stripe on the middle of the back, on each side two black stripes separated by a stripe of light buff. It has roomy cheek-pouches in which it carries surprising quantities of nuts and grain to its nest. When hard beset, it will climb a tree for a short distance; but as it here is an easy prey for its enemies, it shows decided preference for a less exposed re-



CHIPMUNK

treat. Its worst enemies are the birds of prey and the mink, fox and weasel, the last following it into farthest recesses of its burrow. In time of peace chipmunks chirrup together most sociably, and out in the light and air of which they are so fond hold very animated conversations, their chorus sometimes almost a song. The burrow is kept most artfully concealed; no track leading to it. First a perpendicular tunnel is sunk down several feet, next a horizontal passage made for a few yards, then a slight ascent brings to the chamber which is carpeted with grass. From the chamber the ground surface may be reached by a second route, this opening a considerable distance from the first. In the cosy nest well below the frost-line quantities of nuts and grain are stored for winter use, supplies being carried in the cheek-pouches. In the west they work considerable damage and are regarded as nuisances. In addition to nuts and grain, they eat considerable fruit, and are very fond of berries. They are distributed generally in this country, several species being found here. The chipmunk somewhat resembles the little creature popularly called striped gopher, but should not be confused with it. See Hornaday: *American Natural History;* Stone and Cram: *American Animals.*

**Chip'pewa Falls, Wis.,** a city, the seat of Chippewa County, on the Chippewa River and served by four railroads, 132 miles south-southeast of Duluth, Minn., and about 100 miles east of St. Paul. The State Home for the Feeble Minded and the County Insane Asylum are located here, while in the vicinity is the battle-ground (Tone Rock) of a Sioux-Ojibwa conflict. Besides its large lumber interests, the city manufactures wooden ware, shoes, gloves, woolen goods, foundry products, beer and flour. It has some fine public buildings, including churches, schools, court-house and public library, McDonell Memorial High School and the Hanna M. Rutledge Home for the Aged. Population, 8,893.

**Chip'pewa Indians.** See OJIBWAYS.

**Chiv'alry.** See KNIGHTHOOD and FEUDAL SYSTEM.

**Chlorine,** one of the elements, a gas of pale yellow color about two and one half times as heavy as air. It has a powerful odor and is very irritating when present even in very small quantities in the air that is breathed. It is an effective bleaching and antiseptic agent which is usually obtained from chloride of lime, also called bleaching powder, by exposing it to the air or especially by mixing it with an acid. Chlorine is one of the constituents of common salt or sodium chloride. United with hydrogen it forms hydrochloric or muriatic acid, and it occurs in many other substances, such as chloroform, chloral, potassium chlorate, etc.

**Chlorophyceæ** (*klō'rō-fĭs'ē-ē*), plants known as the green algæ, which are abundant everywhere in fresh waters and in damp places, and are of special interest in connection with the evolution of the higher plants. Some of the forms are one-celled, occurring in masses which cover damp tree-trunks, stones, etc., and look like a green stain; others have filamentous bodies, composed of a row of cells more or less elongated; while in other cases filaments become branched. It may be said in general that the filamentous body is the usual type among green algæ. These filamentous bodies may be seen forming felt-like masses in damp places or floating as green thready scum upon the water. Various reproductive methods are developed among the green algæ. The majority of them have the characteristic asexual spores,

which are variously ciliated, and have the power of swimming, being known variously as the zoospores, swarm-spores, swimming spores, etc. Most of the forms also have sexual reproduction, producing a fertilized egg. Some of the forms are free-swimming; while most of them have means of anchoring themselves to firm supports. The main groups are as follows: Protococcus forms, which are one-celled and reproduce mostly by cell-division; Conferva forms, which are filamentous and produce swarm-spores as well as sexual spores; Siphon forms, as in the common green felt; and Conjugate forms, of which Spirogyra, the pond-scum is the best known. The last are called Conjugate forms because in the sexual process two filaments put out tubes toward one another, which meet and form a passageway, and through these improvised tubes the sex-cells pass. The name refers to this yoking together. It is from the green algæ that the higher plants are supposed to have come. JOHN M. COULTER.

**Chlorophyll** (*klō'rō-fil*), the green coloring matter of plants. It is found associated with protoplasm, usually in special bodies called chloroplasts or chlorophyll bodies, which are found only in cells near the surface of parts exposed to light, *e. g.*, in leaves and twigs. These are usually rounded granules much too small to be seen with the naked eye (see Fig. I). In some algæ they are much larger, and have curious shapes. Little is known with certainty of the chemical nature of chlorophyll, because it easily decomposes. Besides the pure green coloring matter (to which the name chlorophyll may be restricted), yellow pigments (carotin or xanthophyll) are associated with it in the mosses, ferns and seed-plants. In some algæ browns or blues or reds may be present also. The green pigment particularly (and in part the others) enables the plant to absorb certain portions of the light. The energy thus gained is partly used in the making of new foods (see PHOTOSYNTHESIS). In the absence of chlorophyll, this work cannot be accomplished. Chlorophyll is probably being continuously produced and destroyed in green plants. It is not usually formed in darkness, and if light is excluded from a green plant the destruction of the chlorophyll leaves it a pale yellow. Autumnal colors are due in part to the decomposition of the chlorophyll.

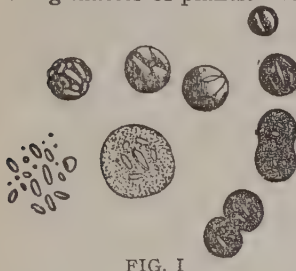
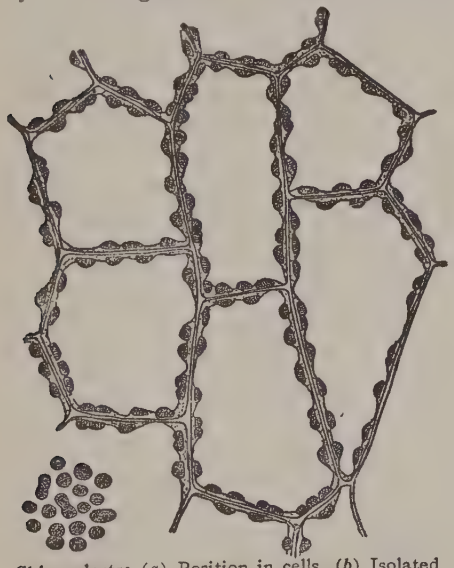


FIG. I



Chloroplasts: (*a*) Position in cells. (*b*) Isolated

**Chloroplast** (*klō'rō-plăst*), a protoplasmic body in plant cells that is stained by chlorophyll, and thus gives the characteristic green color to plants. For the work of chloroplasts see PHOTOSYNTHESIS.

**Choate** (*chōt*), **Joseph Hodges,** a talented and eloquent lawyer, forceful public speaker and United States ambassador to England, was born at Salem, Mass., Jan. 24, 1832. After graduating at Harvard, he adopted law as a profession, and, joining W. M. Evarts in legal practice at New York, he rose quickly to eminence, owing to his high forensic abilities and soundness as a lawyer and counselor. His chief exploits at the bar were his defense of General Fitz-John Porter, when court-martialed on a charge of disobeying orders, and his vigorous campaign against the corrupt Tweed ring in the city government of New York. In 1894 he was chairman of the convention held to revise the constitution of the state of New York. He also took part in the argument before the supreme court of the United States as to the validity of the provision as to income tax in the tariff law of 1894, the court upholding his contention that the income tax could not be collected, but leaving the remainder of the tariff law in force. Mr. Choate was a nephew of the great Rufus Choate. He was noted as a public and after-dinner speaker. In Jan.,

JOSEPH H. CHOATE

1899 he was appointed ambassador to the court of Great Britain. He died at his home in New York City May 14, 1917.

**Choate, Rufus,** an American lawyer, was born at Essex, Mass., Oct. 1, 1799. He graduated at Dartmouth College, and commenced to practice law in 1823. He served as reprsentative and senator in Congress, but his greatest success was at the law. He became the foremost lawyer of New England, and undoubtedly was the first pleader of his day. His speeches and addresses show great oratorical power. He died July 13, 1859.

RUFUS CHOATE

**Chocolate.** See COCOA.

**Choctaws** (*chŏk'tąz*), a widely-spread tribe of Indians, living on the shores of the Gulf of Mexico from the Mississippi to the Atlantic. They lived more by rude farming than by hunting. They are a rawboned, alert but treacherous people. The French gave them the name of Flatheads, from their practice of flattening the heads of their children with bags of sand. De Soto fought a bloody battle with them in 1540. In the wars between the French and English settlers they sided with the French; though one of their great chiefs, Red Shoes, became the friend of the English. Some 500 families moved west of the Mississippi in 1803, and the remainder were offered citizenship by the Georgians; but they preferred to trade their lands for others west of the Arkansas in Indian Territory. They were governed by a written constitution, elected a chief every four years and had a national council of 40 members and trial by jury. Under this government they advanced fast, and in 1861 numbered, with the Chickasaws, who lived with them, 25,000, and owned 5,000 slaves. In the Civil War they took sides with the south and suffered great losses. Schools and missions have been established among them for a long time. In 1900 there were 10,321 Choctaws in the territory.

**Chopin** (*shō-păn'*), **Frederic François,** a Polish pianist and composer, was born March 1, 1809. His waltzes, mazurkas and other compositions are peculiar in melody, rhythm and harmony, and have a great charm. He was one of the first pianists, and his playing like his music, had a captivating grace. He spent most of his life in Paris, where he died Oct. 17, 1849.

**Christian IX** (born in 1818), was crowned King of Denmark in 1863. At his accession he was misunderstood and coldly received by the people, but by his simple manners and democratic bearing he won their respect and esteem. In 1864 Schleswig-Holstein and Lauenburg, about one third of Denmark, were taken from him by Germany. This loss of territory was offset in part by a gain in prestige through his family alliances. One of his daughters became czarina of Russia, another queen of England, one son king of Greece and another king of Norway. He died Jan. 29, 1906, and was succeeded by his eldest son who ascended the throne Jan. 30, 1906, with the title of Frederick VIII. He died of apoplexy in the streets of Hamburg, May 14, 1912. Crown Prince Christian who took the title of Christian X, succeeded him.

CHRISTIAN IX

**Christian Endeavor Movement, The.** This movement originated with the formation of a small society of 50 members in the Williston Church of Portland, Maine, under the direction and with the inspiration of the pastor, Dr. Francis E. Clark, on the evening of February 2, 1881. In February, 1906, after 15 years of life, the movement showed 66,000 societies, with 4,000,000 members, found not only in the United States, but in Canada and Great Britain, in many countries of Europe, in India, China and Japan, in Australia and in Africa. The different societies are independent, united only by a community of principle and plan. There is, however, a corporation, bearing the title of United Society of Christian Endeavor, of which Dr. Clark is chairman. This society collects and distributes the funds that may be sent to it, and seeks to promote in every way the movement. Most of the societies have a constitution that declares the purpose to be "to promote an earnest Christian life among its members, to promote their mutual acquaintance and to make them more useful servants of God." There are active members and associate members. The former bind themselves to attend every meeting of the society to which they belong, unless prevented by absolute necessity, and to take some part, however slight, in every meeting. They are to read the Bible daily and to assist the pastor in the work of the church as he shall direct. The society is interdenominational. A special

feature of the society has always been the appointment of many committees to attend to and systematize various aspects of church work. Conventions are held every year in different parts of the United States. Similar conventions are held in foreign countries. The World's Christian Endeavor Union has been formed, and the Society in America publishes a journal, *The Christian Endeavor World.*

**Christian Era,** the great era, now almost universally accepted, especially in Christian countries, for the computation of time. It is commonly held to correspond to the date of the birth of Christ; but this is scarcely accurate, since that epochal event took place four years before the era now accepted as the commencement of the new epoch in reckoning time. The centuries before the advent of Christ are marked B. C. (before Christ); those that follow are marked A. D. (*anno Domini*). The era is computed from Jan. 1 in the 4th year of the 194th Olympiad; the 753d from the foundation of Rome; and the 4,714th of the Julian period. The new epoch was introduced in Italy in the 16th century, and came into use in England some centuries later.

**Christian Science.** See EDDY, MARY BAKER.

**Christiania,** capital of Norway, was named after Christian IV, who began to build the city in 1624. The national parliament, the storthing, with its two houses, the Lagting and the Odelting, meets here. It has a large university, a fine observatory, two palaces of the king of Norway and a national picture-gallery. An interesting establishment in vogue here is the Steam Kitchen, which provides good and cheap dinners for working people. The great industry is its shipping trade, both foreign and coasting. Its chief exports are of timber and fish. Population, 241,834.

**Christina** (*kris-tē'nā*), queen of Sweden, the only child of the great Gustavus Adolphus, was born Dec. 17, 1626. She succeeded her father when only six years old. Beautiful and brilliant, she was given the schooling then only given to men. She took the ruling power into her own hands in 1644, and six years later, in accordance with her mannish desires, was crowned king instead of queen. She ruled ably for the next four years, but her wayward restlessness could not brook longer the restraints on her personal action which her position of queen made her keep, and she resigned the throne in favor of her cousin Charles, reserving, however, authority over her own household. At this time, when but 28 years old, she traveled over Europe somewhat like a female knight-errant, now becoming very religious at Brussels, now entering Rome on horseback dressed as an amazon, and later shocking Paris by having her grand equerry put to death in her own household for treason. Tired of this wandering life, she thought the death of Charles a good chance to become queen again. But in this she failed. She died at Rome, April 19, 1689.

**Christmas** (*kris'mas*), the day on which the birth of Jesus Christ is observed. The first certain traces of the festival are found about the time of the Emperor Commodus (180–192 A. D.). In the reign of Diocletian a churchful of Christians, gathered to celebrate Christmas, were burned by order of the emperor. The birth was celebrated in May, April and January by the early Christians. It is almost certain that the 25th of December is not Christ's birthday, as it is the rainy season in Judæa, and shepherds could hardly be watching their flocks by night in the plains at that time. The present date came to be used probably because all heathen nations celebrated that season with great festivities, as the old Norse Yule-feast. The beautiful Christmas carols at first were manger-songs, telling the story of Christ's birth. The Christmas-tree with its hanging toys was a custom borrowed from the Romans, and is told about by the poet Vergil. The visit of Santa Claus bearing gifts belongs properly to December 6, the festival of St. Nicholas.

**Christmas Carol, A,** the first and best of strictly Christmas stories, is one of the masterpieces of Charles Dickens. Written for the Christmas of 1843, it was marked by the best gifts of the novelist, humor, fancy, simplicity and tenderness. The old miser, Scrooge, is visited and reformed by the ghosts of Christmas past, present and future.

**Chris'topher, Saint,** according to the old story, lived in Syria, and was put to death as a martyr by the Emperor Decius. He is said to have been 12 feet in height and of great strength. In the pride of his strength, he would serve only the mightiest upon earth. Once he served a powerful king for a while; but seeing his master's fear of the devil, he at once became the devil's servant. But one day he saw the devil trembling before an image of Christ, and decided to serve Christ only. As punishment for not having served Him before, he undertook to carry travelers across a broad stream. One day, so the story goes, Christ came to him in the form of a little child, to be carried over, but at every step the burden grew heavier and heavier. "Wonder not, Christopher," said the child, "for with Me thou hast borne the sins of all the world."

**Christ's Hospital,** a noted school in London, England, with an ancient foundation. It was founded by Edward VI in 1553, as a hospital for orphans. It is usually called the Blue-coat School, from the odd dress worn by the boys. About

30 years ago the cap and petticoat were discarded, but otherwise the garb or uniform is the same to-day as that worn in the 16th century: a blue coat with a red girdle round the waist, knee-breeches, yellow petticoat and stockings, a clergyman's bands at the neck and a small blue worsted cap. Coleridge, Lamb, Sir Henry Maine and other prominent men were educated here.

**Chron'ograph,** an instrument, of delicate mechanism, for measuring and recording minute portions of time. It is used by astronomers for registering the instant occurrence of an astronomical event, directly it happens and is visible. It is also used at horse-races, to record the starting of a race and the instant each horse in the contest passes the winning-post. The chronograph usually registers to one tenth of a second; the delicate records are made by electro-magnetism, and can be brought into action or stopped at any instant through the manipulation of an electric key by the finger. Of this type is the chronograph known as Schultze's, which is so precise and delicate that it can register time to the 500,000th part of a second. Of the ordinary type of chronometer is Benson's which, in principle, is a lever-watch, with a double seconds-hand, the one superimposed on the other. The one in use by astronomers is Strange's, which is connected with the pendulum of an astronomical clock, and makes a dot or other mark on a sheet of paper at the beginning and end of each swing of the pendulum.

**Chronometer.** See CLOCK.

**Chrysan'themum** (meaning golden flower), is a flower growing in the temperate parts of Asia, Europe and North America. There are many varieties, such as the ox-eye daisy, corn marigold, golden feather and marguerites. The most popular variety in our gardens and flower-markets was highly esteemed in China long before it was known in Europe, and gives its name to the Chinese order of honor, the Order of the Golden Flower. It was brought to Europe in 1764, and now there are many hundred varieties. The colors are very various and beautiful. It is popular also because it flowers during the late autumn months. The cultivation of the chrysanthemum and the developing of new varieties have been very much extended in the last few years. Chrysanthemum shows are usually held in all our large cities.

**Chryseis,** the daughter of Chryses, a priest of Apollo, had, according to the story of the Trojan War, been one of the captives of Achilles. In the partition of the booty she fell to Agamemnon, who refused her father's offer of ransom. Apollo avenged the insult by visiting the Greek army with a plague, until Agamemnon, its leader, was compelled to restore Chryseis to her father.

**Chrysostom** (*krĭs'ŏs-tŏm*), **John, Saint** (meaning "golden mouthed"), was born at Antioch about 347 A. D. His mother was a pious woman and devoted herself to her son, who grew into an earnest, gentle and serious young man. He studied, became a monk and spent much time in preaching, in which he was very successful. His eloquence caught the attention alike of Jews and heathen, and gained him the reputation of the greatest orator of the ancient church. Appointed to an important office in Constantinople, he pared down the cost of living and gave what was saved to charities, so that he was called John the Almoner. For trying to reform the lives of some of the monks about him, he was banished to the Taurus Mountains. Even here he could not keep silent, but began to preach to the Persians and Goths in the neighborhood and to write *Letters* and *Homilies*, or explanations of parts of the Bible, which to-day are in the front rank of the literature of the church. But another order came to banish the golden-tongued preacher to the most distant corner of the Eastern empire. So the old man was made to travel on foot and with his bare head exposed to the burning sun. This was more than he could bear, and he died on the way, Sept. 4, 407 A. D.

**Chuquisaca** (*chōō'kē-sä'kä*) or **Sucre,** the capital of Bolivia, is built on a tableland almost 9,000 feet above the sea, shut in by mountains. It has a large cathedral and a college. Its citizens are mostly a mixture of Spaniards with Indians. Population, 23,416. Chuquisaca is also a department of the republic; area 26,400 square miles; population about 237,143, consisting of Indians, Mestizos and whites.

**Church, Frederick Edwin,** a celebrated American landscape-painter, was born at Hartford, Conn., May 4, 1826. He first painted scenes from the Catskill Mountains. He then traveled in South America, and painted his *Heart of the Andes*, *Morning on the Cordilleras*, etc. He also made a sketching trip to Greece and Palestine. His *Tropical Scenery* and *View of Niagara Falls from the Canadian Shore* are among his best works. He died in 1900.

**Church-Councils.** Church-councils are of two kinds, general or œcumenical councils, at which the whole church is represented, and others, in which some division of the church, as a sect or a local division, is represented. The council may meet to discuss matters of doctrine or matters of discipline. Some councils consist of clerical members only; others admit lay members, that is, those who have not been ordained. The latter are more common in Protestant churches. The lesser councils are too numerous to mention, occurring in connection with every sect. The œcumenical councils were held before the division of

the church (about 800 A. D.) into the Eastern and the Western church. The first was held at Nicæa, in Asia Minor, 325 A. D., under the Emperor Constantine. It was in that council that Athanasius won the victory for the doctrine of the trinity, against the unitarians under Arius. The next councils were those of Constantinople (381), Ephesus (431), Chalcedon (451), Constantinople (553), Constantinople (680), Nicæa (787). The Greek or Eastern church recognizes only these as general, because it did not attend the rest; but the Roman church considers the following to be general, holding that the other churches are not real churches, that there is but one church, the Roman Catholic: Constantinople (869), Lateran (1123), Lateran (1139), Lateran (1179), Lateran (1215), Lyons (1245), Lyons (1274), Vienne (1311), Constance (1414), Basel (1431), Florence (1438), Lateran (1512), Trent (1545), and Vatican (1869). The authority of the councils has given way to that of the pope, especially since the council of Trent. At the last council, the Vatican, membership was limited to cardinals, bishops, mitred abbots and generals of religious orders.

**Churchill, Randolph Henry Spencer, Lord,** an English statesman, member of Parliament and second son of the sixth Duke of Marlborough, was born in 1849, and died in 1895. In 1874, on a visit to this country, he married Jennie, daughter of the late Leonard Jerome of New York. In the same year he entered the British Parliament, and later on became a versatile and often audacious speaker, the life and soul of what was then known as the Fourth Party in the chamber. He subsequently became one of the leaders of the Conservative party, and was recognized as a new and powerful, if at times somewhat erratic, political force. He took a prominent part in the Bradlaugh debates, and when Mr. Gladstone fell and Lord Salisbury came into power, Lord Randolph Churchill was appointed chancellor of the exchequer and leader in the commons. In Dec., 1886, differences with his colleagues led to his resignation. He again (in 1892) became a member of Parliament. He died at London, January 24, 1895.

**Churchill River,** 1,000 miles long, flowing into west shore of Hudson Bay near Fort Churchill in the District of Keewatin (Canada). Direction northeasterly.

**Churchill, Winston,** American novelist and contributor to magazines, was born at St. Louis, Mo., Nov. 10, 1871, and graduated in 1894 from the United States Naval Academy. For a time he was editor of the *Army and Navy Journal*, of New York, and managing editor of *The Cosmopolitan*. He has published a number of short naval stories and character sketches of naval officers; an account of the naval battle of Santiago; and three notable novels, dealing powerfully with important eras in American history. These stories are entitled *The Celebrity* (1898), *Richard Carvel* (1899) and *The Crisis* (1901), the latter a story of the Civil War. *The Crossing* (1904), a love story entitled *Coniston* (1906) and *Mr. Crewe's Career* (1908) are his later fiction.

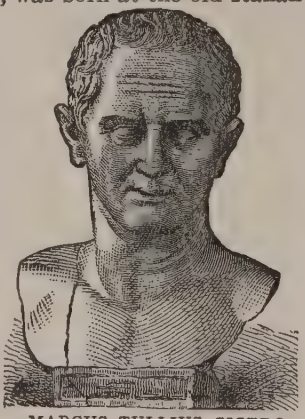
**Churchill, Winston Leonard Spencer,** son of the late Lord Randolph Churchill, English Parliamentary Under-Secretary for the colonies, under Campbell-Bannerman, and first lord of the admiralty under Asquith, was born November 30, 1874, and educated at Harrow and the military school at Sandhurst. In 1895 he entered the army, and saw considerable fighting, and was in many active expeditions in different parts of the world. He first served with the Spanish forces in Cuba; then in India; and later in the Nile expeditionary force in Egypt, and for his services at Khartum received a medal and clasp. Toward the close of 1899 he proceeded to South Africa, and was taken prisoner by the Boers, while acting as war-correspondent. He afterward escaped from custody at Pretoria, and proceeding to Cape Colony he joined the South African Light Horse as lieutenant. With this body of troops he saw much service in the colony, was in many hot engagements and was present at the taking and occupying of Pretoria by Lord Roberts in June, 1900. He remained first Lord of the Admiralty until after the outbreak of the European War but was replaced in that office in 1915 by Arthur J. Balfour on the formation of a coalition ministry under Asquith (*q. v.*). His publications embrace *The Story of the Malakand Field-Force; Savrola* (a novel); *The River War*, an historical account of the reconquest of the Sudan; *London to Ladysmith via Pretoria;* and the narrative of *Ian Hamilton's March.* He has also written a *Life of Lord Randolph Churchill*, his father, which is regarded as a fine piece of biographical literature. See Scott's *Winston Spencer Churchill* (London, 1905).

**Churubusco** (*chōō'rŏō-bōōs'kō*), a village six miles south of the City of Mexico, where was fought a battle between the Americans, under General Scott, and the Mexicans under General Santa Anna, Aug. 20, 1847. The road to Mexico is a high, paved causeway crossing the River Churubusco by a stone-bridge. At this point on the high river-banks Santa Anna made a stand, to arrest Scott's advance to the capital. Scott had won the battle of the Contreras the same day, and he carried the Churubusco position after smart fighting, with a loss in both actions of 1,065; Mexican loss, including prisoners, 7,000, besides artillery.

**Cicada** (*sĭ-kā'dà*), an insect improperly known as the 17-year locust. The name

locust should be restricted to certain grasshoppers, which are the true locusts. The cicadas appear in great numbers at long intervals. Those of the north require 17 years for their development, those of the south 13 years. The eggs are laid in slits in twigs of trees, and are hatched after a period of six weeks. Instead of a caterpillar or grub, a nymph is produced. The latter has legs, but no wings. They drop to the ground and burrow and live by sucking the juices from the roots of trees. After 17 years they reach maturity and come to the surface. The skin splits open along the back and the perfect insect comes out. They attract attention far and near by their loud, shrill singing. Their life in this stage lasts but a few weeks. In some localities several broods overlap, which explains the fact that the insect appears in those localities more than once in the period of 17 years. The dog-day harvest-flies are also cicadas. These develop in two years, but, as there are two broods, they appear annually.

**Cicero, Marcus Tullius,** orator, statesman and writer, was born at the old Italian town of Arpinum, 106 B. C. In boyhood he went to Rome, and was put through a thorough and wide course of study to fit him to be an orator. Among the Romans the calling of an orator was what we would call that of a lawyer and a politician, the orator pleading law cases before the bar and speaking on political questions in the senate, thus requiring a wide and varied knowledge. In 76 B. C. he held an appointment in Sicily, where he became popular with all classes and obtained the information which enabled him, in 70 B. C., to impeach successfully the wicked governor of Sicily, Verres. This scoundrel felt himself crushed by Cicero's opening speech and fled the country. The orator had already become well known by earlier speeches, and now became a power in the state, and rose rapidly still higher. In 63 B. C., at the age of 44, he was a consul, the highest office within reach of a Roman. In the same year, by his boldness and promptness, he checkmated the dangerous conspiracy of Catiline, delivering in the senate those famous *Orations against Catiline*, which brought the senators almost to a man to his support. Cicero was now at the height of his power, but his hot eloquence had carried the senate too far. Some of Catiline's band had been put to death by a simple order of the senate. This was a stretch of power for which Cicero was held responsible, and the Father of His Country, as he had been called but a short time before, was banished and his two houses were plundered. Though the changeable people welcomed him back with shouts in the following year, he never regained power. No longer confident in himself, he halted between allegiance to Cæsar and allegiance to Pompey, and was held to be a time-server. It was a time when the old republic was crumbling to pieces, and only a strong man could build upon its ruins what would be stable and lasting. Cicero was gentle, amiable, clever and learned, but strong he certainly was not.



MARCUS TULLIUS CICERO

The later years of his life were spent chiefly in pleading at the bar and in writing essays. After Pompey's overthrow at the battle of Pharsalia, he became Cæsar's friend; but he never liked Cæsar's other friend, Mark Antony; and in the year following Cæsar's death the aged orator appeared once more in the senate, making his famous speeches against Antony, which he called *Philippics*, after the title of Demosthenes' orations against Philip of Macedon. These cost him his life. Antony's proscription-list of his enemies, who were thereby outlawed, was published, and Cicero's name was on it. Old and feeble, he fled, pursued by Antony's soldiers, and was overtaken as he was being carried in his litter down to the shore to embark. With courageous coolness he put his head out of the litter and told the murderers to strike. This was in December, 43 B. C.

Cicero as an orator stands in the first rank. Of his speeches that have come down to us, the finest perhaps are those against Verres and against Catiline. His essays on *Old Age*, *On Friendship* and *Whole Duty of Man* (de Officiis) are most pleasant reading. His letters are classics of epistolary literature. It was a remark of Erasmus: "I feel a better man for reading Cicero."

**Cid** (*sĭd*), **The,** the name given to Rodrigo Diaz, a famous warrior of Spain, who was born about 1040. He was commander of the army of Sancho II, king of Castile, in the wars in which that king tore Leon and Galicia from his brothers. Sancho was killed treacherously during a siege, and Alfonso, the banished king of Leon, became king. The Cid was soon afterward banished himself, and with a motley following he offered his services to the king of Saragossa and fought ably against his enemies. After besieging Valencia on his own account for years, he conquered the

city, and reigned over the district until his death, five years later, in 1099. He appears to have been a bold and able soldier and a born leader of men. These adventures and many other things which he never did are told in the *Cid Poem*, written in the 12th century, probably the oldest literature in the Spanish language. The story of the Cid was told by the story-tellers who wandered over the country, welcomed at every castle, where they enlivened the long evenings by telling stories of the national heroes, after making up adventures which they tacked on to the lives of such men as Charlemagne and the Cid. It was from these stories that the poem, with other chronicles and ballads about him, was made. On this story Corneille based his *Le Cid* and Southey his *Chronicle of the Cid.*

**Cider** is the fermented juice of apples. Usually, apples that are sour in taste are used, and late apples make better cider than early ones. The apples after gathering are left to mellow for some days. The juice is crushed out by passing the apples between fluted rollers or in mills of various kinds. The pulp is placed in bags or in wicker-work frames with holes, and the juice is drained into tubs. This juice is kept for the finest quality of cider. The rest is squeezed out in a press. This pressure, especially where unduly great, adds juice from the pipe and skins and gives it a coarser flavor, though in larger quantity. Eight to ten days' fermentation takes place in casks with large bungholes, the vinegary yeast frothing to the top, which is constantly removed. The cider is next freed of the sediment by being placed in fresh casks, and this is repeated in the spring. Champagne cider is made by bottling the juice before it is fully fermented. Cider contains from four to ten *per cent.* of alcohol.

**Cienfuegos** (*sē'ĕn-fwā'gōs*), a city of Cuba, is in Santa Clara province on the southern side of the island. Its harbor was discovered by Columbus in 1492, and is one of the finest harbors in the West Indies. The port's commercial advance in recent years has been so rapid that Cienfuegos has become the second seaport in Cuba. To-day it is the center of the sugar-trade on the Caribbean coast. The city has well-shaded, attractive streets, its residences are substantially built, and it is lighted by gas and electricity. The climate in summer is oppressive, but the winter climate agreeable. Railroads connect Cienfuegos with Havana and Sagua la Grande on the northern coast and with Santa Clara, the western terminus of the Santiago railway. Steamers give communication with New York. The population is 70,416. During the Spanish-American war the port was long blockaded by the American fleet.

**Cimabue** (*chē'mȧ-bōō'ȧ*), **Giovanni,** an Italian painter, was born at Florence in 1240. The art of painting had in his day fallen into decay, and Cimabue's attempt to follow nature, painting from a living model, was called "a new thing in these times." His two madonnas are still preserved in Florence, but he is best known as the teacher of Giotto and as the founder of the Florentine school of painters which included Michael Angelo and Raphael. He died about 1302.

**Cimbri** (*sĭm'brī*), a people who, together with the Teutons, came out of the north of Germany, and moving southward fought against the Romans in 113 B. C. At first victorious, they were prevented from ravaging Italy by Marius, who routed them in a battle near Verona in 101 B. C. In this battle they showed the greatest courage, even the women killing themselves and their children when they saw that all was lost. Years later, Cæsar and Tacitus speak of the Cimbri, who appear to have lived, a few in number, in the far north of Germany. They probably belonged to the German race.

**Cimon** (*sī'mŭn*), an Athenian commander, was the son of Miltiades, the conqueror at Marathon. At the time of the Persian War he was made one of the two commanders of the Athenian section of the Greek navy, commanded by the Spartan, Pausanias. His greatest encounter was in 466 B. C., with a Persian fleet of 350 ships at the River Eurymedon, when he destroyed or captured 300 vessels and also defeated the Persian land-force on the same day. He became very popular in Athens, but later was opposed by Pericles and the democracy and banished, though he was recalled in five years. He died during one of his sieges, in 449 B. C.

**Cincinnati** (*sĭn'sĭn-nā'tĭ*), the second largest city of Ohio and tenth in rank in the United States, is situated on the Ohio River in the southwest part of the state. It is built upon two terraces, the first 60 feet and the second 112 feet above the river, surrounded by a circle of hills, about 450 feet high, forming one of the most beautiful amphitheaters on the continent. The city embraces nearly 72 square miles, extending along the Ohio River for about 15 miles. The city and its suburbs cover the surrounding hills, which are reached by a series of street-railways with inclined planes, one having a height of 275 feet. Cincinnati is noted for the beauty of its suburbs, which stretch for miles in all directions, with costly residences and large and ornamental grounds. The suspension bridge between Cincinnati and Covington is 2,252 feet in length, and was built at a cost of $2,000,000. There are 18 parks and a zoological garden; Eden park, covering 215 acres, and Mt. Airy Forest, with 795

acres, being the largest. Of the 21 cemeteries, the largest is Spring Grove, containing 600 acres, and said by travelers to be the most picturesque cemetery in the world. The Tyler-Davidson fountain, a bronze fountain cast in Munich at a cost of $200,000, was the gift of a private citizen, and is one of the ornaments of the city. Among buildings of note are the hospital, erected at a cost of $4,000,000; the cathedral, with a stone-spire 224 feet high; the Masonic temple, the Art museum in Eden park, the Havlin and Sinton hotels, Ingall's building, the great Exposition building and Music hall with its noted grand organ.

Cincinnati is an important commercial and manufacturing city, and, since 1870, a port of entry. It for many years was the leading city of the west, called the Queen City. Its trade in pork was the largest in the country until 1863. Its manufactures are numerous and extensive, especially in iron, leather, shoes, paper, soap and carriages. Cincinnati has always been noted for its interest in literary and educational matters, and it also has a wide reputation as an art and musical center. The Cincinnati University, with 263 instructors and 2,298 students, Lane Theological Seminary, medical and law schools, the art-school and museum, a free school of design, a free public library, mercantile library and historical library, Emma Louise Schmidlapp Memorial Library, and the Lloyd Library, devoted to botany and pharmacy, are among its many institutions. Its great school of wood-carving and the Rookwood pottery are each celebrated. The ware from this pottery ranks with the art-product of the most famous potteries of the Old World, and may be found in the best private collections on both sides of the Atlantic.

Cincinnati was permanently settled in 1788, and named in honor of the Society of the Cincinnati. The river trade, which began with the arrival of the first steamboat in 1811, gave it its early importance. It became a city in 1819. In 1845 the first railroad entered the city. The population is largely foreign, one entire part of the city, called "Over the Rhine," being German. Population, 405,898.

**Cincinnati, Society of the,** a society of officers of the Revolutionary army, organized at the close of the war to keep up friendships and especially to raise a fund for widows and orphans of their comrades who had lost their lives in the war. It was named from the old Roman hero, Cincinnatus, as many of the members had similarly left their farms at the call to arms. As membership was made to descend from father to son, an outcry was made against the society by Franklin and others, who saw in it the germ of a future aristocracy. This caused some of the branches to disband. But there still are several state societies in active existence.

**Cincinnatus** (*sĭn'sĭn-nā'tus*), **Lucius Quintius,** was made consul of Rome in 460 B. C. When the messengers came to tell him of his election, they found him ploughing on his small farm. Two years later he was made dictator. The barbarous Æqui had surrounded the consul Lucius Minucius and defeated him. Cincinnatus marched to his aid and rescued him. Sixteen days later he laid down the unlimited power of the dictatorship and went back contentedly to his small farm on the Tiber. At the age of 80 he was again made dictator. He was a favorite hero among the later Romans, who looked on him as a model of goodness and simple manners.

**Cinematograph** (*sĭn'ĕ-măt'ô-grăf*). This is an instrument which casts upon a screen a number of successive views which have been taken from a moving object, in so swift an order that the eye does not observe that the picture has been changed. The spectator appears to behold one and the same view, in which the objects are in actual motion. On an average about 100,000 pictures are needed for an exhibition which is to last one hour. The instrument was invented in 1894 by Edison.

**Cinnamon.** See SPICES.

**Circas'sians,** the name sometimes given to all the formerly independent peoples of the Caucasus, more strictly to the tribes living in the northwest wing. The Circassians are a handsome race, their girls being the most beautiful in the Turkish harems. They also are strong, brave and temperate. For years they struggled fiercely agianst Russia, to keep their independence, and in 1858–65, rather than submit, nearly the whole nation of 15 tribes, about half a million in number, left their country for the Turkish part of Asia Minor or the mountains of Bulgaria. See CAUCASUS.

**Cir'ce,** a sorceress about whom Homer tells us in his *Odyssey*. Round her palace in Ææa were many men and women whom she had changed into the shapes of lions and wolves by her drugs and charms. Twenty-two of Ulysses' companions she changed into swine, but Ulysses himself was given an herb, which protected him. So he went boldly to her palace, was unhurt by her drugs and persuaded her to disenchant his companions. She also taught him how to escape many dangers on his homeward voyage. Another story about Circe is that she poured the juice of poisonous herbs into that part of the sea where Scylla, of whom she was jealous, was accustomed to bathe, and so changed her into a horrid monster.

**Circulation of Blood,** the course of the blood in its round from the heart back

again. A simple case of circulation is illustrated in the crayfish, where the heart consists of a single chamber with muscular walls. When it contracts, the blood is sent, in arteries, forward, backward and downward; on its return path it passes through the gills. In the clam there is a two-chambered heart. In fishes there are two chambers; in frogs and toads three; in the highest reptiles and all birds and mammals four chambers in the heart. The ancients believed that the arteries contained air, and only the veins blood. Galen (131–200), in the 2d century, demonstrated that both arteries and veins contain blood, but a direct connection between the two was not thought of. In the 16th century such a connection was believed in by Vesalius and others. In 1628 William Harvey published a book in which he maintained that the quantity of blood leaving the heart and the rate at which it leaves made a return to the heart necessary. This marks an epoch in physiology. He did not, however, see the minute vessels connecting arteries and veins. It remained for Malpighi, in 1661, and Leeuwenhoek, in 1669, to demonstrate, with the microscope, the existence of minute tubes connecting arteries and veins, and thus to show that the circulation takes place in a series of closed tubes. For further facts regarding circulation see HEART.

**Cir'cus,** in Roman usage, was a large, oblong building, used for chariot and horse-races, athletic exercises and wild-beast fights. According to tradition, circuses originated with Romulus, and subsequently these games became popular, and several buildings were put up for their use, the largest being called the Circus Maximus. This was enlarged several times, and is reported to have held from 150,000 to 385,000 persons. In the time of Julius Cæsar it was 1,875 feet in length and 625 feet wide. It was oblong in form, rounded at one end and square at the other, with tiers of stone seats on the sides and curved end, while at the square end were stalls for the horses and chariots. The Romans were very fond of the chariot-race. Usually, four chariots raced seven times round the circuit. Boxing, wrestling and even battles were engaged in. Canals were also dug and sea-fights shown. Animals were brought from as far as Asia and Africa. Free shows were given by politicians to curry favor with the people. Pompey gave a five days' circus, during which 500 lions and 20 elephants were killed. Often the Romans would demand bread and circus-games from candidates for office.

**Citizenship.** The term citizen implies membership in a political community, and involves on the one side his allegiance to and support of that community, and on the other the protection of the citizen by the community. It does not imply the right to vote or to hold office. These privileges may be and often are withheld from citizens, while granted to those who are not citizens. This modern use of the term citizen must be contrasted with the original use, which prevailed among the Greeks, and which is thus defined by Aristotle: A citizen is one who has the right to take part in both the deliberative and judicial proceedings of the community of which he is a member. Our idea of citizen is related to that of subject, as that term was used in England when this country separated itself from England; for a subject meant one who owes allegiance to the king and demands protection from him. The country with us takes the place of the king, — that is the difference. By the original constitution of the United States it was left uncertain whether citizenship related in the first place to the state and only secondarily to the nation, or *vice versa*. The fourteenth amendment, passed by Congress in 1866, approved by the requisite number of states and proclaimed law in 1868, decrees that all persons born or naturalized in the United States and subject to the jurisdiction thereof, are citizens of the United States and of the state wherein they reside. This made national citizenship fundamental, and declared that state citizenship follows from it. Those living in territories and the District of Columbia are not citizens of any state, though they may be citizens of the United States.

Citizenship does not rest on descent, fundamentally, but on the fact of birth on the soil of the United States. A person born of alien parents on the soil of the United States, unless he reserves allegiance to the country of his parents, is a citizen. Exceptions are Indians not taxed and persons born in the Philippine Islands until they shall be declared a territory (Supreme Court decision, May 1901). Citizenship is *extended* to those born abroad of a father who is a citizen, and to an alien woman married to a citizen (Acts of Congress, April, 1802, and Feb., 1855). The third extension of citizenship is to naturalized persons. To be naturalized the alien must have declared his intention to become a *bona fide* citizen at least two years before admission, must have resided in this country five years, and must swear that he does not believe in polygamy or disbelieve in organized government. He must speak English. An alien landing before he is 18 may be naturalized at 23 without a previous declaration of intention. The fourth extension is to one whose father is an alien, and who himself was born abroad, but who is under 21 and resides in this country when his father is naturalized.

Citizenship does not give the right of suffrage, and suffrage may be conferred without citizenship. Female citizens in most and illiterate or propertyless citizens are in some states deprived of a vote; while on the other hand many states extend the right to vote to those who have not yet become citizens, but have declared their intention to do so. The fourteenth and fifteenth amendments do not require that citizens be permitted to vote. The fourteenth amendment declares that what privileges and immunities citizens possess by the laws of the state and the nation shall not be abridged. But voting is not such a privilege. The fifteenth amendment simply declares that, whatever limitation the state may impose in the matter of voting, it shall not be based on "race, color or previous condition of servitude."

In ancient states the right to trade and to the protection of the laws rested upon citizenship. But this rule does not prevail in modern civilized states. Citizenship also means membership in a city, and then largely refers to the rights that follow from the fact of being taxed. The member of any republic, as that of France, is called a citizen. A British subject also styles himself a British citizen, because of the democratic basis of his government.

**Cit'ron,** the fruit of a species of *Citrus* (*C. medica*), a genus of the rue family, to which belong also the orange and lemon. The citron is a large lemon-like fruit with

CITRON

a thick rind, which is used in the making of preserves. Citron cultivation in the United States is chiefly developed in Florida and California.

**Citrullus** (*sĭ-trŭl'ŭs*). A genus of plants of the gourd family, which includes the watermelon (*C. vulgaris*). The three species are widely distributed in Africa, the melon belonging to tropical and southern Africa. One of the species (*C. colocynthis*) from the Mediterranean regior yields colocynth, a drug obtained as an extract from the fruit.

**Civil Service** is the executive branch or department of government, composed of those who serve the state or crown in a civil capacity, as opposed to those employed in the military and naval services. In England it is one of the oldest institutions of the country, dating from the earliest monarchical times, though it is only within the past century that the English civil service has assumed its present vast proportions. In this country, as in all enlightened states, the civil service branch of government is usually separated into three distinct departments, viz.: the legislative, judicial and executive branches. In the United States the divisions of the executive civil service are—the departmental service, the customs service, the postal service, the government-printing service and the internal-revenue service. The number of positions in the United States executive civil service is now close upon 330,000, of which more than half are classified competitive positions, and all employed are under civil-service rules, prescribed by act of Congress in 1883. That act authorized the president to appoint three civil service commissioners to regulate and improve the service, to make regulations to govern the examinations and to investigate and report upon all matters touching the enforcement and effect of the rules and regulations. The purpose of the law and its governing rules is to establish, in the parts of the service within their provisions, a merit-system whereby selections for appointments shall be made upon the basis of demonstrated relative fitness without regard to political or other considerations. To carry out this purpose a plan of competitive examinations is prescribed, and, when vacancies occur, the appointee is drawn from the eligibles of the highest grade on the appropriate register; and every appointment is made at first for a probationary period of six months. It has to be added that there are what are known as preference claimants, viz.: persons who have served in the military or naval service of the United States, and were discharged by reason of disabilities resulting from wounds or sickness incurred in the line of duty. Such are released from all maximum-age limitations; are eligible for appointment at a grade of 65, while all others are obliged to obtain a grade of 70; and are certified to appointing officers before all others.

Examinations are also held for positions in the Philippines, Porto Rico and Hawaii

and for the Isthmian Canal service. The chances of appointment in the U. S. Civil Service are understood to be good for teachers, matrons, seamstresses and physicians in the Indian Service, for male stenographers and typewriters, draughtsmen, patent examiners, civil, mechanical and electrical engineers and for technical and scientific experts. Rules and regulations governing the admission of persons into the civil service in large cities and states, such as New York, are also prepared and acted upon through municipal civil service commissioners.

In Great Britain the departments of the civil service are the treasury, the exchequer and audit department, the foreign office (including the diplomatic service), the India, Colonial and Home offices, together with the three revenue-departments of the postoffice, inland revenue and customs. There are others, including the spending departments, the war-office, admiralty, board of trade, board of works, education office, privy council office, the stationery office, agriculture and fisheries, charity commission, ecclesiastical and church estates, government laboratories, observatories and record office, the mint, patent-office, meteorological office, national debt office, the local government board, etc. These are grouped under two grades—I and II—and appointments, for the most part, are made on the competitive plan. See Fish: *The Civil Service and the Patronage* and Goodnow's *Principles of the Administrative Law of the United States* (1905).

**Civil War, The.** See UNITED STATES.

**Cladophyll** (*klăd'o-fil*) (in plants), shoots or branches which have replaced leaves in their work and resemble them in form. The so-called leaves of the ordinary smilax of the greenhouses are cladophylls, the true leaves occurring beneath them in the form of small scales. The same word is sometimes written phylloclad.

**Claiborne** (*klā-bôrn*), **William,** an early Virginia colonist and secretary of state for the colony, was born in Westmoreland, England, about the year 1589, and died in Virginia about 1676. He came to Virginia in 1621, where he bought large estates, and ten years later established a trading-post on Kent Island, Md., in Chesapeake Bay, some seven miles from where Annapolis now stands. This island and post were subsequently claimed by Governor Leonard Calvert to belong to Maryland, and in consequence a long dispute ensued between Calvert and Claiborne in respect to it. During the period of the English commonwealth Claiborne took the parliamentary side against the Calverts of Maryland, and subdued Virginia in the name of the protector. Cromwell, however, did not endorse his actions, but restored the Calverts to power, and after the restoration of the Stuarts Claiborne fell in favor and retired to a neglected life upon his colonial estates. There was another of his name, WM. CHARLES COLE CLAIBORNE (1775–1817), who was governor of the territory of Mississippi from 1804 to 1812 and governor of Louisiana (1812–16).

**Clam,** the name applied to the freshwater mussel and similar animals living in salt water. They have bivalve shells, held closed by muscles and open by a springy ligament on the back of the shell; therefore, the shell of a dead clam always stands open. They creep through the mud and sand of the bottom by means of a fleshy foot. A current of water is drawn through a tube and is strained through the plate-like gills; it then passes into a chamber in the body and out by another tube. The food consists of minute animals and organic matter in the water. This is separated by straining the water through the gills, and is carried to the mouth by the movement of small hair-like projections or cilia. The shell is secreted by glands in the mouth, which covers the body, and is enlarged by rings as the animal grows.

**Clan** (meaning children), a name given to men banded together because of having a common ancestor or because of any other tie; but the word almost always means the divisions of the Scottish Highlanders. The clan was made up of men dwelling together or having a common surname. The affix *Mac* (meaning son) was a common one among Scottish Gaels: the Macdonalds were the sons of Donald. The members of a clan were usually not all blood-kin; men of various births were in the habit of enlisting under chiefs as men now enlist in a regiment, often taking the chief's name, but often not. The clan was really a military band for self-defense and for pillage. The Scottish law required all clans to have, if possible, a man of rank and property at their head, who could be held responsible for their good conduct. Clans which could find no security were called broken clans; their members were outlaws, and might be hunted down like wild beasts. The McGregors were a noted broken clan; their name was proscribed, and clansmen who wished to live peaceably in the lowlands, changed it slightly, calling themselves Gregor, Gregory, Grierson, etc. In general the great landowners were also mighty chiefs; men from broken clans were often received by the chief into the clan by bonds of man-rent, under which they engaged to follow their captain in all his feuds and quarrels, this being a form of the feudal system. But often the landlord was not the chief, and against his will the people of a clan usually followed their chieftain. The clan's name was kept up, as a reminder of past times, long after the

tribal system had died out. The Scottish rebellions of 1715 and 1745 induced the British government to suppress or break up the connection that existed between the clansmen and their tribal or family chiefs.

**Clar'endon, Edward Hyde, Earl of,** historian and statesman, was born Feb. 18, 1608, at Dinton, England. When young, he had such gay companions as Ben Jonson and his lifelong friend, Falkland, and, as he himself said: "He never thought himself so good a man as when he was the worst in the company." As a member of the short and long parliaments he sided against the king, Charles I, but in 1641 drew back and thenceforth supported Charles, composing his answer to the Grand Remonstrance and advising him in the troublous times which followed.

Under Charles II he was high chancellor. His efforts were directed to the restoring of the kingdom to the condition of things which existed 20 years earlier. He looked with equal sourness on Charles' vices and religious toleration, displeased Cavalier and Puritan alike, and was blamed for the sale of the fortress of Dunkirk to France and even with the Great Fire and the Great Plague. Impeached for high treason, in 1667, he spent the remainder of his life in exile. His *History of the Rebellion in England* is an apology for the course of himself and Charles I, rather than a fair and impartial history. He died in France in 1674.

**Clarendon, George William Frederick Villiers, Earl of,** an English diplomatist, was born in London, Jan. 12, 1800. He was a man of genius and charming manners, of rare tact and perfect temper, qualities which insured his success in the diplomatic service, in which he became distinguished. As ambassador to Spain, in 1833, he used the large influence which he soon gained in helping Espartero to establish the government of Spain on a constitutional basis. In 1847 he became lord-lieutenant of Ireland, where he had a rebellion and a famine to contend with. In 1853 he was placed at the head of the foreign office, and upon him fell the responsibility of the Crimean War and at its close the negotiations in regard to the balance of power in Europe. He died on June 27, 1870.

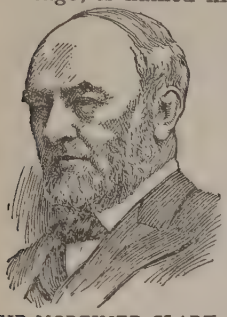
**Clarinet** (*klăr-ĭ'-nĕt*) or **Clarionet,** a wind-instrument usually of wood, in which the sound is made by a single thin reed. It was probably invented by Joseph Denner, of Nuremberg, in 1690; but it has since then been much changed and improved, so that it now is one of the best of wind-instruments. The tube is round, and enlarged at the end in the form of a bell. It has holes to be covered by the fingers and left thumb, and keys, usually 13, to give the extra tones. The mouthpiece is flattened on one side, along which the reed is laid, leaving a slight opening so that when blown the reed vibrates against the mouthpiece and thus causes the sound. The clarinet has a much greater compass than the flute. It is used in orchestras and is the leading instrument in military bands.

**Clark, Alvan,** American optician, engraver and manufacturer of telescopes, at Cambridge, Mass., was born at Ashfield, Mass., March 8, 1808, and died at Cambridge, Mass., Aug. 19, 1887. Early in life he was a portrait-painter; but in 1845 he turned his attention to the mak ng of achromatic lenses and manufacture of telescopes. Associated wtih his sons, he constructed object-glasses for universities, for the Naval observatory at Washington and for the Lick observatory in California. He also had orders for his firm from Russia, from the Imperial observatory at Pulkowa. After his death, in 1887, hi s two sons pursued their father's vocation, manufacturing optical instruments, making improvements in telescopes, designing models, etc. One instrument, a 40-inch telescope, they constructed at a cost of half a million dollars for the Yerkes observatory at Lake Geneva, Wisconsin. One of the sons, Alvan Graham Clark (1832–97), was also an astronomer of note.

**Clark, Francis E.,** the founder and president of the United Society of Christian Endeavor, was born in 1851 at Aylmer, Canada. He studied at Dartmouth College and at Andover, Mass., and was pastor in Maine and South Boston. He is the author of many books, and editor of the *Christian World.* The United Society of Christian Endeavor grew out of a small Young People's Society of Christian Endeavor which he founded at Williston Church, Portland, Maine, February 2, 1881.

**Clark, George Rogers.** This great pioneer and soldier was born at Monticello, Va., in 1752. Previous to the Revolutionary War he had gained experience as a land-surveyor and also as an Indian-fighter. At the opening of the war he moved to Kentucky, and was returned as a member of the first legislature of Virginia, Kentucky being then part of that state. In 1778 he organized and commanded the campaign to conquer what was known as the Illinois country, the woods and prairies around the great Illinois River. He drove the French as well as English settlers from the country or compelled them to submit to the authority of the Continental Congress. He captured and, later, recaptured the fort of Kaskaskia, taking many British troops prisoners. At the end of the war he still was in possession of this vast territory. And this fact was probably the chief argument that led the English and French to extend the domain of the newly-formed nation up to and beyond the Mississippi. But for Clark it is not unlikely that the

Northwest Territory would have been handed over to England or Spain in the treaty of 1783. The legislature of Virginia created Clark a brigadier-general, and gave him 8,049 acres of land in what is now the state of Indiana, not far from Louisville. Twice he was presented with a sword. But after the war his energy led him astray. He led an unsuccessful campaign against the Wabash Indians, and tried to organize an expedition to open the Mississippi River to navigation against the authority of the Spanish, with whom we were at peace. He spent the last years of his life in poverty on the land that Virginia had granted him. He died in 1818. Clark Street, Chicago, is named in his honor.



SIR MORTIMER CLARK

**Clark, Sir William Mortimer,** was born and educated in Aberdeen, Scotland, and studied law at Edinburgh University, becoming a writer to the Signet. He removed to Canada at the age of 23. Appointed lieutenant-governor of the province of Ontario, he now holds this position.

**Clark, William Robinson,** M.A., D.D., LL.D., D.C.L., F.R.S., of Canada, has been professor of philosophy in Trinity College, Toronto, since 1882. He was born in Inverurie, Scotland, March 26, 1829, the son of a clergyman. He was educated at King's College, Aberdeen, and Hertford College, Oxford, and was admitted to the priesthood of the church of England in 1858, becoming prebendary of Wells in 1870. He was Baldwin lecturer in the University of Michigan in 1887 and Slocum lecturer in 1899 In addition to several important works of a religious nature, including the lectures mentioned, he has edited and translated Hagenbach's *History of Christian Doctrine* and Haefele's *History of the Councils.*

**Clark University** was founded by Jonas C. Clark in 1887, in the city of Worcester, Mass., for the purpose of promoting research by post-graduate students in scientific rather than in philosophical or literary subjects. An undergraduate department, was added (1902), of which the late Carroll D. Wright, the well-known statistician, was made president. In the university proper, courses are now offered in mathematics, physics, chemistry, biology, anthropology, psychology, education, economics and sociology, history and modern languages. The president is G. Stanley Hall, the psychologist, father of child-study in America, and it is in the department of psychology and education that the university has secured the most notable results. The university is unique in offering a "degree of docent," certifying to fitness, both in scholarship and teaching ability, for an academic chair or college professorship. There are 31 fellowships, worth from $200 to $600 a year. There are exceptional facilities to get in touch with the latest literature upon the subjects above mentioned. The library contains about 40,000 volumes, and receives over 200 journals, mostly technical in character.

**Clarke, James Freeman,** an American clergyman, was born at Hanover, N. H., April 4, 1810. He graduated at Harvard College and Cambridge Divinity School, becoming pastor of a Unitarian church at Louisville, Ky., and afterward of the Church of the Disciples in Boston. Dr. Clarke became widely known as a religious writer. His best known books are *Ten Great Religions* and *Orthodoxy, Its Truths and Errors.* He died June 8, 1888.

**Clark, Capt. Wm.** See LEWIS AND CLARK EXPLORATION.

**Clarks'ville, Tenn.,** a city and county-seat of Montgomery County, is located on the Cumberland River, about 40 miles from Nashville. The surrounding country is a tobacco-growing region, and the city has tobacco and snuff-factories and lumber and flour-mills. The Southwestern Presbyterian University is located at Clarksville, and the city is served by the Louisville and Nashville and Tennessee Central Railroads. Population, 8,548.

**Claude Lorrain** (*klōd-lŏr-rān'*) (real name Claude Gelée), landscape painter, was born at Champagne in 1600. When a boy, he was carried to Rome by a relative who deserted him. But he soon obtained a place as servant to a painter, learning to paint as he ground his master's colors. After wandering about Europe, he painted for ten years at Rome before his pictures were sought after; but four landscapes painted by him for the pope gave him the fame he had been working for. He painted about 400 landscapes. Among the best are the series, *Morning, Noon, Evening* and *Twilight.* Claude himself liked best his *Villa Madama,* keeping it in his study and refusing to sell it, even when the pope offered for it as much gold as would cover the canvas. He also produced etchings, of which *Le Bouvier* is the finest. Claude's pictures brought such high prices, even during his lifetime, that many copies and imitations have been sold as his. He died at Rome in November, 1682.

**Claudius,** Roman emperor, a nephew of Emperor Tiberius, was born at Lyons, in Gaul, in the year 10 B. C. A sickly boy, he was neglected and left pretty much to himself, growing up a timid student. When Caligula was murdered, he hid himself in a corner of the palace, fearing that he

would be the next victim. A common soldier, finding him, saluted him as Emperor; others entered and bore him to the camp, where he was crowned, 41 A. D. In his reign the southern part of Britain was conquered and Mauritania made a Roman province. At home his rule was mild in the main, but he was influenced by his wives—he married four times—to commit some cruel acts. Two of his wives, Messalina and Agrippina, were among the worst Roman women of whom we know; and it was Agrippina who poisoned him in 54 A. D. to secure the throne for her son, Nero. Claudius built the famous Claudian aqueduct, and spent large sums in other improvements at Rome.

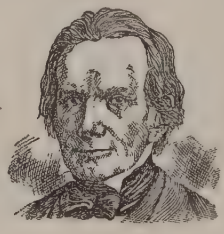
**Clausius** (*klou'zē-ūs*), **Rudolf Julius E.,** a distinguished German physicist, born at Köslin, in Pomerania, Jan. 2, 1822; died at Bonn, Aug. 24, 1888. He was educated at Berlin University, where he later became *privat-docent* and still later an instructor in the school of artillery. In 1855 he went to Zürich as professor of physics in the Polytechnic school; two years later he accepted the chair of physics in the University of Zürich. From 1869 until his death he was professor of physics in the University of Bonn.

His best work was done at Berlin, for it was here, between 1845 and 1850, that he placed the science of thermodynamics upon a sound basis, building the entire structure upon the then recently discovered principle of the conservation of energy. In addition to this, his most important contributions are perhaps to the kinetic theory of gases and to the subject of radiant heat.

**Clay** is a term rather loosely applied to all sorts of earthy matter, which, when wet, becomes sticky or plastic. In this respect, clay is in contrast with sand. The stickiness depends in part on the size of the individual particles. The smaller they are, the more tenacious the clay. Clay originates from the decomposition of certain sorts of rock, especially those containing feldspar. In the popular use of the term no account is taken of the composition of clay, but silicate of alumina is a common constituent. Common clays also contain free silica, iron oxide, etc. When beds of clay are solidified by natural means, they constitute the rock known as shale. Flagstones are a variety of shale, and slate is a variety of rock formed from shale by great compression. Clay is widely used in the manufacture of brick, tile, pottery, etc. and in modeling. For the finer wares, such as china and porcelain, especially fine grades of clay (kaolin) are required. The value of the products manufactured from clay in the United States in 1898 exceeded $71,000,000. The leading states in the utilization of clay, in the order of their importance, are Ohio, Pennsylvania, New Jersey, Illinois and New York. The value of the clay-products of these five states in 1898 was considerably more than half the total value of clay-products in the United States.

**Clay, Cassius Marcellus,** American statesman, abolitionist and United States minister to Russia, was born in Madison County, Ky., Oct. 19, 1810, and graduated from Yale in 1832. For a time he practiced law in Lexington, Ky., became a member of the state legislature and was an active antislavery man and the editor of *The True American*, which brought him into collision for a time with the proslavery men of his state. He served in the Mexican War of 1846–47 and was taken prisoner. He afterward took part in the elections of Presidents Taylor and Lincoln, and in 1861 was appointed United States minister to Russia, in which capacity he served from 1863 to 1869. He died Nov. 28, 1913. See the *Memoirs, Writings and Speeches of Cassius M. Clay.*

**Clay, Henry,** a noted American statesman and orator, was born in Hanover County, Virginia, April 12, 1777. His father died when he was five years old, but his mother, a woman of great goodness and force of character, well supplied his place in the boy's training. After a meager amount of schooling, Henry entered a Richmond law-office. Commencing to practice at Lexington, Kentucky, he soon became known as an able lawyer, his high personal gifts, winning address and frank, hearty manner helping him here, as they did all through life. From the first he took an interest in public affairs, and after two years in the state legislature, was chosen United States senator to fill a vacancy. He at once became an advocate of the government's building roads, canals, etc., being known as a loose constructionist of the constitution, as it is called. His short term over, he went back to the Kentucky legislature. This was in the days of duels, and it is not strange that Clay should have fought two, one at this time in Kentucky and, later, one with John Randolph of Virginia, both growing out of politics. In 1809 he was chosen to fill a second vacancy in the senate. In this session he spoke in favor of protection to American manufactures against foreign traders. He also opposed the United States Bank, but later he changed his views in the matter, the only instance in which he ever changed his attitude on a political question. In 1811 he was elected a representative in Congress, and the day on which



HENRY CLAY

he took his seat was chosen speaker. He was heartily in favor of war with England, and named his committees with a view to an early declaration of war. The war party was in a majority in the 13th Congress, which met in May, 1813, and again Clay was made speaker. When overtures of peace were made by the British, Clay was appointed one of the commissioners, and helped to draft the treaty of Ghent. Re-elected to Congress while in Europe on this mission, he was chosen speaker for the third time, and, except one term, when he declined an election, he was a representative and speaker until 1825. At this session he made some of his finest speeches, in favor of the South American patriots who were struggling for independence from Spain; later on he was just as eager in behalf of Greece, when fighting to free herself from the yoke of Turkey. In 1821 he brought forward the famous Missouri Compromise; 20 years afterward, when South Carolina wished to secede on the tariff question, he proposed a gradual lowering of the tariff, such as would work the least harm to manufactures; and in 1850 he attempted, by compromise, to settle the slavery question, which his Missouri Compromise had failed to dispose of, and in other ways he stood between the warring factions of north and south, to bring about concessions that would, in a measure, satisfy both sides, thus winning the title of the Great Pacificator.

In 1824 Mr. Clay was one of the four candidates for president, and received 37 electoral votes. In 1832 he ran for president again; but was beaten by Jackson. He was nominated again by the Whigs in 1844, but beaten by Polk, who received 65 more electoral votes. Clay served as secretary of state in John Quincy Adams' cabinet, and, besides filling the two vacancies in the senate referred to, was chosen senator from Kentucky for three full terms. One of those who opposed him politically is on record as saying that as a congressional leader Mr. Clay had no equal in America. He was the most persuasive speaker in the country during what was called the golden age of American oratory. He was, further, most popular with his party, while few men had a larger following of personal friends. He died at Washington, D. C., on June 29, 1852.

**Clayton-Bulwer Treaty,** a treaty concluded in 1850 between the United States and Great Britain, by which the contracting parties agreed that neither power should obtain or exercise exclusive control over a ship-canal then contemplated to be constructed across Central America and connecting the Atlantic with the Pacific. The negotiators were, on the part of Britain, Sir Henry Bulwer Lytton (afterward Lord Dalling), brother of the novelist; and, on the part of the United States, J. Middleton Clayton, secretary of state under President Taylor. The treaty, about 1880 and 1900, once more came under public discussion, in consequence of efforts being made to proceed actively in the construction of the Nicaragua Inter-Oceanic Canal, which many of our senators and public men desired to place, untrammeled, under the control of the United States. A new agreement was reached in 1901 through the adoption of the Hay-Pauncefote Treaty. This treaty omitted the restrictions against fortification, and this has been interpreted by the United States as giving her the right to fortify. Without such a right, the defenders of this interpretation point out, her coasts would be far more open to attack with the canal than without it. Her objections to defending the canal by agreement among the Powers are that such treaties are often observed only so long as it is to the interest of the parties to observe them; furthermore, that under such an arrangement the canal would be as open to the fleet of an enemy as to her own. Under her treaty with Panama the United States binds herself to maintain the neutrality of the canal, the independence of the republic of Panama and that the canal shall be open to all nations on uniform terms.

**Clearing-House.** See BANKS

**Cleary, The Most Reverend James Vincent,** Archbishop of Kingston, was born at Waterford, Ireland, 1828, and studied theology at Rome, Maynooth (Ireland) and Salamanca, Spain. In 1854 he was appointed professor of theology in St. John's College, Waterford, becoming president in 1873. He was appointed bishop of Kingston (Ontario) in 1880 and archbishop in 1889. He reopened Regiopolis College (theological) at Kingston in 1896, giving a large private contribution for the purpose.

**Cleburne, Texas,** the county-seat of Johnson County, is located in a good agricultural region. Its leading industries are cotton-gins, flour-mills and machine-shops. The division-offices and shops of the Gulf, C. & S. F. R. R. are located here. Cleburne has good schools, and is a growing, progressive city. Population, 16,505.

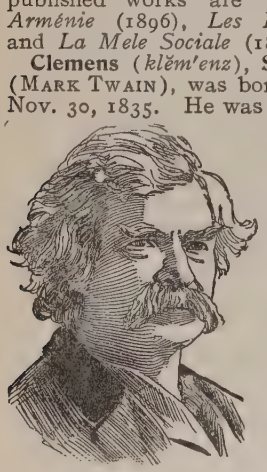
**Cleistogamous** (*klīs-tŏg'ă-mŭs*) **Flowers** In many flowering plants, in addition to the ordinary conspicuous flowers, there are other flowers which are very small and inconspicuous, and even concealed. The common violet is a prominent illustration of such a plant. Cleistogamous flowers are now known in very many genera Such flowers never open, are self-pollinated, and are very productive of good seed.

**Clem'atis.** A genus of plants of the crow-foot family, consisting of climbing vines or erect herbs, all more or less woody. About 150 species are recognized, which

are widely distributed, about 20 of them being native to North America. Many of the climbing species are cultivated to cover walls, arbors, etc. The flowers are often very showy and of numerous shades.

**Clémenceau** (*klā'män'sō'*), **George B. E.,** a French statesman and senator and premier of France and minister of the interior, under the presidency of Armand Fallieres. A clever debater and born orator, as well as an able journalist in his day, M. Clémenceau is one of the most picturesque figures in modern politics. A native of Brittany (he was born in 1841 in the department of La Vendée), he early studied and for a time practised medicine in Montmartre, and then travelled abroad, paying a brief visit the while to the United States. In 1869 he returned to France, and two years later was elected to the National Assembly, later on becoming a member of the Chamber of Deputies and leader of the Extreme Left. Though holding radical views, he has usually acted with moderation and good sense, though he was compelled successively to oppose Gambetta, Jules Ferry and the Boulangists. For a number of years he devoted himself to journalism, editing for a time not only his radical journal, *La Justice*, but contributing many notable articles to *L'Aurore*, among them several defending Dreyfus, besides writing fiction and social studies and taking active part in politics and the questions of the day. Chief among the controversies of the time is the part played by M. Clémenceau in defining the relation of Radicals to Socialists, in reply to M. Jaures, the Socialist leader. Among his published works are *Les Massacres d' Arménie* (1896), *Les Phis Forts* (1898) and *La Mele Sociale* (1895).

**Clemens** (*klĕm'enz*), **Samuel Langhorne** (MARK TWAIN), was born at Florida, Mo., Nov. 30, 1835. He was first a printer, and afterward a pilot on the Mississippi River. One of the commonest sounds heard on a Mississippi steamboat in shallow water is the call of the man sounding the depth of the water —"Mark Twain," meaning mark two fathoms; and when Clemens wanted a pseudonym, he took this familiar call. After spending some time in the silver mines of Nevada, he became a journalist in San Francisco. He became widely known as a humorist through his first book, *Innocents Abroad* which he brought out in 1869. *Tom Sawyer*, perhaps his most popular work, was published in 1876. Other of his works are *A Tramp Abroad* (1880); *The Prince and the Pauper* (1882); *Life on the Mississippi* (1883); *Huckelberry Finn* (1885); *Pudd'nhead Wilson* (1895); *Tom Sawyer Abroad* (1894); *Personal Recollections of Joan of Arc* (1896); *Following the Equator* (1897); *The Man that Corrupted Hadleyburg* (1900); *Christian Science* (1903); *How to Tell a Story* (1904); and *Editorial Wild Oats* (1905).



SAMUEL L. CLEMENS

Through the failure, in 1894, of the publishing house of Charles L. Webster & Co., of which he was the founder, Mr. Clemens was left deeply in debt. To retrieve his fortune he entered upon a lecturing tour, which extended around the world and furnished material for *Following the Equator*. On the completion of this tour he resided for a time in Vienna. He returned to America in 1900, and actively resumed literary work. In 1907 he visited England, where he was most heartily received, and was honored with the degree of D.C.L. from the University of Oxford. Mark Twain's humor is simple and direct, never strained, and has been described as "a sort of good-natured satire in which the reader may see his own absurdities reflected." He died April 21, 1910.

**Clement** (*klĕm'ent*), the name of 17 popes.

**Clement XIV** was born in 1705, near Rimini, Italy. He studied and taught philosophy and theology, was a friend of Benedict XIV, became cardinal under Clement XIII, and was elevated to the papal chair on May 19, 1769. In 1773 he issued his famous brief, suppressing the Society of the Jesuits. He was remarkable for his high character and learning as well as for his liberal ideas. He died on Sept. 22, 1774.

**Clementi** (*klā-mĕn'tē*), **Muzio** (1752–1832), an Italian composer and pianist. The work by which he is best known is his *Gradus ad Parnassum*, a series of 100 piano-studies. Though his contemporary, Mozart, spoke of him with a sneer, he was highly esteemed by Beethoven for the virile and artistic traits developed in his sonatas.

**Cleopatra** (*klē'ō-pā'trā*), daughter of the Egyptian king Ptolemy Auletes, was born in 69 B. C. Her father wished her to reign jointly with her brother, who was also, according to the Egyptian custom, to be her husband; but the boy's guardian drove her from the throne. She was just about to return from Syria, backed by an army, when Cæsar reached Egypt in pursuit of Pompey. Her charms won the great soldier to her cause, who placed her again on her throne, this time with a still younger brother as colleague and husband, of whom she quickly rid herself by poison. Soon after she followed her conquering lover to Rome

where she was covered with honors. After the battle of Philippi, Mark Antony summoned her to appear before him at Tarsus. The Egyptian queen sailed up the River Cydnus to meet him, in a sumptuous galley, arrayed as Venus rising from the sea. Then under 30 years of age, in the perfection of her Grecian beauty, she fascinated the heart of Antony, who henceforth became her lover and slave. Leaving her to marry Octavia, sister of Octavianus (afterward Emperor Augustus), he hurried back to the arms of Cleopatra, who met him in Syria and proceeded with him on the march to the Euphrates. After this, Antony's time was spent mostly with her at Alexandria, where he loaded her with gifts and honors. It was Cleopatra's counsel that Antony followed in risking the naval battle of Actium; and when she fled with her 60 ships, he forgot everything else, and "flung away half the world to follow her." When Augustus appeared before Alexandria, the fickle queen at once treated with him for her safety; while Antony, on being told that she had killed herself, fell on his sword. But finding the report was false, he had himself carried into her presence and died in her arms. Cleopatra, now Augustus' prisoner, finding that she could not win him, as she had won Cæsar and Antony, from disappointed pride took poison or killed herself by suffering an asp to bite her bosom (30 B. C.). Two women only, Helen of Troy and Mary Stuart, vie with Cleopatra in the fascination which her story exerts over men's minds.

**Cleopatra's Needle.** See OBELISK.

**Cleveland, Stephen Grover,** was born at Caldwell, New Jersey, March 18, 1837.

GROVER CLEVELAND

He began to practice law at Buffalo in 1859. He was assistant district-attorney for three years, and in 1870 was chosen sheriff and, later, mayor of Buffalo. In 1882 he was elected governor of New York by 190,000 majority. After an exciting canvass he was elected president of the United States in 1884, receiving 219 electoral votes. The most important act of his administration was his message to congress in 1887 in which he announced a tariff policy on which the election of 1888 turned, when Mr. Cleveland was defeated by General Harrison, receiving 168 electoral votes to Harrison's 233. During his term as president he married Miss Frances Folsom of Buffalo, who brought social success and popularity to his administration. In 1892 he was nominated a third time for the presidency, and was elected, defeating General Harrison. His second administration added to his fame as a wise and able executive. Retiring to private life at Princeton, N. J., he there interested himself in delivering addresses at Princeton University, a collection of which he published in 1904. His death occurred June 24, 1908 at his New Jersey home.

**Cleveland, O.,** county-seat of Cuyahoga County, takes high rank among the cities of the United States in the rapid growth of its commercial interests, in the administration of its schools and other public affairs and its development of ideals of civic beauty and usefulness.

Standing on a plateau, which in places rises 200 feet above Lake Erie, with its great public square, wide thoroughfares lined with magnificent buildings, its residence districts with handsome homes in spacious grounds fronting on streets of majestic elms, wide spreading maples and other shade trees, it is one of the most attractive of our great centers of population. The arrangement and construction of its public buildings under what is known as the Group Plan at a cost of $25,000,000 was begun in 1902. The city is divided by the Cuyahoga river which is spanned by five great viaducts. In the public square is the Soldiers' and Sailors' Monument and statues of Moses Cleaveland who laid out the city, and of Tom L. Johnson, former Mayor of the city, known as the "father" of three cent street car fare. The majestic Garfield Monument occupies a conspicuous site in Lakeview Cemetery, which lies on a ridge 250 feet above the lake. Its numerous office buildings include the Rockefeller, New Guardian, Garfield, Rose, Citizens, Williamson, Leader-News, and Union National Bank. One of the twelve Federal Reserve banks is located in Cleveland. It also has several arcades running through an entire block, which are used for mercantile and office purposes.

Among the other beautiful structures are many churches of every denomination. Besides its fine public, it has many parochial schools and other educational institutions, including Western Reserve University, the College for Women, St. Ignatius College, St. Mary's Theological Seminary and Case School of Applied Science. It is one of the best governed cities in the country in its methods of caring for the poor, its reformatory institutions, such as the Warrensville Farms, its self-governed Boyville Home, its play grounds, parks, public baths and schools.

Of social, fraternal and business clubs, Cleveland has more than one hundred. Many of these are country clubs devoted to golf, tennis, hunting and other sports. Its downtown athletic club ranks with the finest in the country.

Its public piers, covering five acres, were built at a cost of $500,000. Its industrial plants line the numerous railroads entering the city and are scattered up and down the valley of the Cuyahoga River. The natural meeting point of Lake Superior iron ore, and coal from Ohio, West Virginia and Pennsylvania, Cleveland is the largest ore market in the world. It takes its place as one of the largest manufacturing cities in the United States and is noted for its iron and steel plants, its shipyards, automobile plants, and numerous other industries, including steel rails, car wheels, engines, boilers, cranes, printing presses, sewing machines, oil and gas stoves, and electrical apparatus and machinery. Optical instruments and other specialties requiring scientific skill are made in Cleveland in great variety. It is also a great center for the manufacture of wearing apparel, paints and chemicals. It is the site of one of the largest oil refineries in the country; is a large market for fresh water fish; handles large quantities of lumber and grain, and, what may be of particular interest to boys and girls, makes a large proportion of our chewing gum. Population, 701,803.

Cleveland was laid out in 1796 by Moses Cleaveland, and incorporated in 1836. The village bore his name and its spelling. This, however, from time to time changed, but the present spelling became permanent, it is said, in 1831, because the "a" made the word a misfit in the head-line of a newspaper.

**Cliff-Dwellers.** See PUEBLOS.

**Clingman, Thomas Lanier,** United States senator and Confederate officer, was born in North Carolina in 1812, and died at Raleigh, N. C., Nov. 4, 1897. After graduating, he studied law, and was a member of Congress from 1843 to 1858, taking a prominent part in the debates of the house. Originally a Whig, he deserted his old associates and became a Democrat, and in 1858 was elected to the senate. In 1861, when the Civil War broke out, he withdrew from the senate and entered the Confederate army, where he became brigadier-general, surrendering in April, 1865, with General J. E. Johnston. After the war General Clingman for many years devoted himself to mining and to scientific pursuits.

**Clinostat,** an apparatus for rotating plants in various planes to counteract the effect of a one-sided stimulus, such as light or gravity (see IRRITABILITY). It consists of a strong clock-work, with suitable regulating mechanism and devices for holding the pots in which the plants are grown.

**Clinton, Iowa,** a rapidly growing city, capital of Clinton County, Iowa, is situated on the Mississippi River between Davenport and Dubuque, and 140 miles by rail west of Chicago. It has communications with all points by a number of railroads, by steamboat-navigation on the river and two fine bridges across the Mississippi connects it with Illinois and the east. It possesses many thriving industries, embracing foundries, machine and car-shops, paper-mills, sash, door and blind-factories, furniture-factories, wagon-factory, wire-cloth factory and glucose-factory. Population, 25,577.

**Clinton, Mass.,** a town of Worcester County, 12 miles from Worcester, on the Nashua River. It has several churches, a hospital and The Bigelow Free Public Library of 25,000 volumes. Located here are the Bigelow Carpet Co., the Lancaster Mills and the Clinton Wire-Cloth Co. Clinton has the service of the New York, New Haven and Hartford and the Boston and Maine railroad. Population 13,301.

**Clin'ton, De Witt,** was born at Little Britain, N. Y., March 2, 1769. He was a son of Gen. James Clinton and a nephew of Gov. George Clinton. He graduated at Columbia College, and after studying law he entered politics as a Republican member of the lower house of the New York legislature in 1797, where he soon became the leader of his party in the state. He was chosen United States senator in 1802, and was at this time regarded as "the most rising man in the Union." But he left the senate to become mayor of New York city, an office of considerable power in those days, which he held for 11 years. On the question of war with England, he competed for the presidency with Madison, receiving 89 votes. He was elected governor of New York four times. His greatest service to the state was in urging the construction of the Erie Canal, and pushing the measure assiduously till he saw that great enterprise completed and the canal open for traffic. Clinton was dignified in manner, of fine personal appearance, deeply in earnest in all he undertook, energetic, capable and popular. His life-work is identified with the early growth of the state. He died at Albany, N. Y., Feb. 11, 1828.

**Clinton, George,** one of the prominent men of the Revolution, was born in Ulster County, New York, July 26, 1739. He had a careful schooling at home. As lieutenant of militia, he took part in the expedition against Fort Frontenac (Kingston), Canada. He entered law, but was chosen a member of the colonial assembly, where he soon became the head of the Whig party. In 1775 he became a member of the Continental Congress and voted for the Declaration of Independence; subsequently he was appointed brigadier-general. He was soon after chosen governor of New York, and was re-elected six times in succession. In the Revolutionary War it was due to him that communication was hindered between the British in Canada and those in

New York city. The number of Tories in the state made his position the most difficult to fill of any in the country, except that of Washington. When the time came to adopt the Constitution, Clinton opposed it, on the ground that it gave the general government too much power. In 1804 he was elected vice-president of the United States, on the ticket with Jefferson, and was re-elected in 1808. He died at Washington, D. C., April 20, 1812.

**Clinton, Sir Henry,** an English general, was born about 1738. He served in the Seven Years' War, and was sent to America as major-general in 1775. He took part in the battles of Bunker Hill and Long Island, and captured Fort Clinton on the Hudson. In 1778 he became commander-in-chief of the British land-forces. He was forced out of Philadelphia by Washington, captured Charleston in May, 1780, and sailed from New York with 7,000 men to relieve Cornwallis on the day he surrendered. He was superseded by Sir Guy Carleton in 1781. Later on, he was appointed governor of Gibraltar, where he died December 23, 1795.

**Clive** (*kliv*), **Robert, Lord,** founder of England's Indian empire, was born near Market-Drayton, England, Sept. 29, 1725. At school Robert was a much better fighter than a scholar. At 18 he went to India as a clerk of the East India Company, where, penniless and tired of the drudgery of his life, he attempted suicide, but his pistol snapped twice, and he decided to bear his trouble a while longer. When the French took Madras in 1746, Clive escaped in the night from the city, disguised as a Mohammedan, and made his way to Fort St. David. Now 21, he was commissioned as ensign in the military service of the company. India was at this period rapidly falling into the hands of the French, and the safety of the English trading-posts was gravely in peril. Clive, now 25, had gained a name for desperate courage as well as for military genius. Assuring his superiors that a move must be made at once on Arcot, he was intrusted with 200 British troops and 300 Sepoys. He seized Arcot without a blow, and with his little force, now reduced to 80 Englishmen and 120 Sepoys, he withstood a siege of 7,000 natives and 120 French soldiers for 11 weeks. Then, after a last assault, the siege was raised, and Clive, marching out, won two battles and captured two important forts. After two years spent in England, where he refused a diamond-hilted sword from the company until another was given to his superior officer, he came back to India in 1755 with the rank of lieutenant-colonel. A year later, with Admiral Watson, he sailed for Calcutta, to avenge the Black Hole massacre. Calcutta and other places were speedily taken from the barbarous nawab of Bengal, Surajah Dowlah, and at Plassey, June 23, 1757, Clive's 3,200 men, two thirds of whom were Sepoys, fought 50,000 natives, supported by 40 French guns. After eight hours' fighting, Clive won the decisive battle which fastened English rule upon Bengal. Mir Jaffir, one of the nawab's generals, had agreed before the battle to keep his forces inactive, for which he was to be made nawab. An unscrupulous go-between threatened to betray this agreement, and demanded from the British a large sum of money. Clive, however, overreached him by a false treaty, to which he forged Admiral Watson's name. When Plassey had been won, Mir Jaffir was at once declared nawab, and, leading Clive into the great treasury of Bengal, told him to help himself, which he did, taking over $1,000,000. These are the only two blots on his character. For three years Clive was ruler in all but name in Bengal, and was always called by the natives Sabat Jung, the daring warrior. In 1760 he returned to England, where he was welcomed by the great Pitt, as "a heaven-born general," was chosen member of Parliament, and made baron of Plassey. But by 1765 the affairs of the East India Company were in a bad way, owing to the rank dishonesty of its servants, and only Clive could set them right. As governor and commander-in-chief of Bengal, he set out a third time for India. At once he attacked the widespread abuses with vigor. At one time 200 officers of the army resigned, thinking to force him to submit by the sight of an army without leaders; but the Sepoys stood firm, and by issuing commissions for new officers, even to clerks, and by ordering every resigned officer to be brought to Calcutta he quelled all insubordination. But the energy with which he had cleaned that Augean stable had raised up a host of powerful enemies, who, after he had left India for good, stirred up Parliament to look into his early proceedings in Bengal. Attacked in regard to the fortune he had amassed, he described the glittering heaps on which he had gazed in the treasury of Bengal, and exclaimed: "Mr. Chairman, at this moment I stand astonished at my own moderation!" This storm of enmity broke his health and unhinged his mind, and opium did the rest. He died at London by his own hand, Nov. 22, 1774.

**Clock.** An ordinary clock is a machine for driving a wheel at the uniform rate of two revolutions a day. The energy for driving the machinery is stored up either in a raised weight or in a coiled spring. The uniformity of the motion is secured by use of a pendulum and an escapement. The clock in this form was invented by the great Dutch physicist Huygens in 1657. Galileo had already shown that the pendulum, when left to itself, performs its vibrations in equal times. Huygens showed how

the pendulum might be kept going and the advantage of its uniform vibrations thus be obtained. This he accomplished by the introduction of the escapement, a mechanism which is unlocked by the pendulum at each beat and thus allows the train of wheels to advance. But in addition to this the escapement also gives the pendulum a little push, which just makes up for the loss of energy which the pendulum sustains in swinging through the air and in unlocking the train.

ANCHOR ESCAPEMENT

The action of the escapement will be evident from the accompanying figure, in which the arrow indicates the direction in which the mechanism is driven by the spring or weight. In the upper part of the figure are represented the two pallets which receive alternate pushes to right and left as, one after another, the teeth of the wheel pass. A good clock of this type keeps better time than the sun; and accordingly we now use as our standard of time the period of revolution of a fictitious sun which revolves uniformly with the average speed of our actual sun. This is called mean solar time. The astronomer uses a clock in which the hour-hand rotates at the same rate at which the fixed stars appear to revolve about the earth. In other words, this instrument, which is called a sidereal clock, rotates at the same rate as the earth, which is the most uniform motion that we know anything about.

American clock-making from early days has had an interesting history, the men who have been connected with it being many and in their way characters, from Isaac Doolittle, in the old colonial times, who as a brass-founder built a bell-foundry and made brass wheel-clocks, to the era of the New Haven Clock Co., with its originators in Hiram Camp of Plymouth and Chauncey Jerome of Bristol, Conn. Interesting, too, is the story of Eli Terry, the father of wooden clock-making, as is that of the men who had to do with the New Haven concern—such as James E. English, H. M. Welch and Hiram Camp, the latter the inventor of a number of automatic tools and machines for making parts of clock-works, and perhaps the greatest of American clock-makers.

The chronometer is merely a spring-clock in which an oscillating wheel called the balance is employed instead of a pendulum. This wheel is lightly tethered by a fine spring called a hair-spring, and its value lies in the fact that its vibrations occupy equal times. In 1714 the British government offered a reward of $100,000 to any one who would devise a means for getting longitude at sea within 30 miles. Stimulated, perhaps, by this offer, John Harrison (1693–1776), an English mechanician, invented the chronometer, which enabled navigators even then to determine their longitude within 18 miles.

A watch is merely a small chronometer that can be carried in the pocket. A striking clock is one fitted with a bell which is struck by a hammer at certain equal intervals, generally an hour. It is this form of instrument from which we derive our word clock, which originally meant a bell. Driving-clocks are really engines operated by a spring or weight. Telescopes in observatories are made to follow the stars by means of such driving-clocks.

Time-keeping before the invention of clocks was a very crude process. During the day the ancients were dependent upon the position of the sun, and during the night upon the positions of certain well-known fixed stars. Intervals of time were measured by allowing sand or water to run through funnel-shaped vessels, called hour-glasses and clepsydræ respectively. See Sir E. Beckett's *Clocks, Watches and Bells;* Benson's *Time and Time-Tellers* and Britten's *Watch and Clock-Makers' Handbook.*

**Close Pol'lina'tion** (in plants), the transfer of pollen from the stamen to the stigma of the same flower. See POLLINATION.

**Clouds** are masses of water-vapor condensed into very minute drops of water or frozen into very small particles of ice. Every one is familiar with fogs. Clouds are simply fogs formed at a considerable distance above the earth. They are generally white in appearance for the same reason that any transparent substance, such as glass or sugar, is white when broken up into small particles.

The classification of clouds generally employed is the one which divides them according to their external appearance into four different groups:

1. The *cirrus* or mare's tails clouds are composed of long white fibers or slender filaments. They are generally observed at great heights, and are probably composed of small crystals of ice. Glaisher in his balloon-ascents found cirrus clouds above him even at the height of 23,000 feet; while, on the other hand, cirrus clouds are

never seen below the summit of Mt. Blanc, which is nearly 16,000 feet in elevation.

2. *Cumulus* clouds are those which look like great mountains of cotton piled one on top of another and resting on a horizontal base. It is highly probable that the rounded top of these clouds results from columns of hot, moist air rising and thrusting their tops into the upper and hence cooler regions of the atmosphere.

3. *Stratus* clouds consist of large flat layers or horizontal sheets. They are seen very frequently about sunset.

4. The *nimbus* or rain cloud has no particular form, but generally is large and gray or dark.

Regarding the causes which operate to produce clouds, we may group them all under one general head, *namely*, a lowering of the temperature of the air below the dew-point. Among the particular causes which produce this fall of temperature are the following:

(*a*) Radiation of heat from the earth to space, especially at night. This is the most frequent cause of fogs on land. (*b*) Radiation from the earth's atmosphere to space. (*c*) Expansion of heated air on rising to higher regions of the earth's atmosphere where the pressure is less. (*d*) A cold wind blowing into a region filled with warm, moist air.

Another condition necessary for the formation of clouds is the presence in the air of small dust-particles or of ions. This fact has been demonstrated mathematically by Kelvin and experimentally by Aiken. In reply to the frequent query as to why the clouds do not fall, it is to be said, *first*, that they may be falling when in quiet air, but, *secondly*, when particles are as small as those involved in the case of clouds, their surface becomes enormously large compared with their mass; so that the resistance which the air offers to a falling body of this size is also enormous when compared with its weight. Hence the rate of fall is, in general, so minute as to escape observation.

**Clo'ver,** species of the genus *Trifolium*, belonging to the pea family. The name is chiefly applied to those species which are used in agriculture. It is also sometimes applied to species of other genera in the same family, as the sweet clover, which is *Melilotus;* prairie clover, which is *Petalostemon*, etc. About 300 species of *Trifolium* have been described, and they are well-known by their habit and three-foliolate leaves. The common red clover (*T. pratense*) is probably not native to North America, but has come from Europe. The white clover (*T. repens*) has been introduced from Europe, but is also probably native to North America. Numerous native species belong to North America, especially in the far west.

**Cloves.** See SPICES.

**Clo'vis,** king of the Franks, was born 465 A D., and died in 511. He conquered the Gallo-Romans, and overran the whole country between the Somme and the Loire. His wife, Clotilda, was a Christian, and earnestly wished her husband to become a Christian also. In a great battle with the Alemanni Clovis was hard pressed, and at last in despair cried to the God of Clotilda, offering to become a Christian if he got the victory. The Alemanni were driven from the field and on Christmas day Clovis and his soldiers were baptized; while he received from the pope the title of Most Christian King.

**Clyde,** the most important river of Scotland. It flows for 106 miles, past Lanark, Bothwell and Glasgow, the head of navigation, and at Dumbarton becomes a firth. Near Lanark are the four famous Clyde falls. Below Glasgow large sums have been spent in deepening the channel, so that the former depth of 15 inches at low water has now become from 18 to 20 feet. The first steamboat in Europe was launched on the Clyde in 1812. The last 14 miles of the river, together with the firth, which slowly widens from one to 37 miles, are one of the world's chief commercial waterways. There is a very large amount of shipbuilding on the Clyde.

**Clytemnestra.** See AGAMEMNON.

**Coal,** a name applied to considerable aggregations of carbonaceous matter of vegetable origin. Coal has no definite chemical composition, the proportion of carbon varying from 95 per cent. or even more down to 70 per cent. or a little below. Coal occurs in beds interstratified with shale, sandstone, etc. The vegetation from which coal was made is believed to have grown where the coal now occurs. At the time of the growth of the vegetation, the regions where it grew are believed to have been swamps comparable, except in size, to the peat-bogs of the present time. As the vegetation growing in the bogs died, it fell into the water of the swamps, as in the case of the Dismal Swamp of the present time. Beneath the water the dead vegetation did not decay as it would have done in the open air, though it underwent chemical changes. The first series of changes resulted in its transformation into peat. After the accumulation of considerable beds of vegetable matter in the swamps, the sites of the swamps seem to have been submerged, probably by sinking. When submerged, either beneath the sea or beneath the waters of lakes, sediment, such as sand or mud, was deposited over the accumulated vegetable matter. Thus buried, the vegetable matter was still more completely shut off from the air and underwent further chemical changes. At the same time the weight of the sediment above

the accumulated vegetation compressed it into more and more compact form. As the result of the chemical changes and the compression, the vegetable matter was gradually brought to the condition of coal.

In many regions there are numerous seams or beds of coal, one above another, separated by beds of shale, sandstone, etc. Each bed of coal represents the succession of conditions sketched above. After the burial of one body of vegetable matter the area was perhaps elevated sufficiently to cause it to become a marsh again, and the growth of vegetation followed. This in turn was buried.

Wood contains about 50 per cent. of carbon. In the chemical changes which it undergoes in peat-bogs, it loses some of the carbon, but still more of its oxygen and hydrogen, so that the proportion of carbon remaining after the changes is greater than before. Peat contains about 60 per cent. of carbon. With the loss of more hydrogen and oxygen, and with compression which renders it solid, peat is transformed into coal When the changes have gone so far that the proportion of carbon is as great as 90 per cent., the coal is anthracite. When the proportion of carbon is less, the coal is said to be bituminous or soft. Of bituminous coal there are many grades, depending partly upon the proportion of carbon. The chemical changes in the vegetable matter may go so far that the proportion of volatile matter (hydrogen and oxygen) is reduced to one or two per cent. In this condition the coal is said to be graphitic. Graphitic coal does not burn readily. Anthracite coal, which contains relatively little volatile matter, burns with little flame. Bituminous coal, which contains more volatile matter, burns with flame, and in general burns more readily as the proportion of volatile matter increases. There are several varieties of bituminous coal, named according to their uses. Among them are coking-coal, furnace-coal, cannel-coal, etc. Coking-coal melts on becoming hot, and after the volatile matter escapes the solid product is coke. It has much the composition of anthracite coal, but is spongy in texture. Cannel-coal is impure, and contains much volatile matter. It is rather earthy in texture, and less hard than most other varieties of coal. It is extensively used for burning in grates Furnace-coal is any sort of bituminous coal appropriate for use in furnaces.

Anthracite coal occurs mainly in regions of folded strata, where the folds have been greatly eroded. The compression to which the coal was subject in the process of folding, the heat generated by the compression and the subsequent exposure of the coal-beds after erosion, allowing the volatile matter to escape, have probably been the chief factors in the transformation of soft coal into anthracite. In some places in New Mexico and Colorado soft coal has been changed into anthracite by contact with lava. Bituminous coal, as may be inferred from the above, usually occurs in regions where the strata are horizontal or but slightly tilted.

The coal of the United States belongs partly to the carboniferous system (see GEOLOGY) and partly to the systems of later periods, especially to the last part of the cretaceous. There is a little coal in the triassic system of the east (Virginia and North Carolina), and very considerable quantities of coal in the tertiary of the west, especially in Washington.

The coal product of the leading coal producing countries in 1910 was as follows:

| | | |
|---|---|---|
| United States | 501,596,378 | metric tons |
| Great Britain | 296,007,699 | " " |
| Germany | 245,043,120 | " " |
| Austro-Hungary (1909) | 54,573,788 | " " |
| France | 42,516,232 | " " |
| Belgium | 26,374,986 | " " |
| Russia and Finland | 24,967,095 | " " |
| Japan (1909) | 16,505,418 | " " |

The total product of all other countries was probably not more than 40,000,000 tons.

The United States coal-fields of the carboniferous period are as follows:

1. New England field (Rhode Island and Massachusetts—coal more or less graphitic and little used).

2. The Appalachian coal-field, including the coal-producing areas of Pennsylvania, eastern Ohio, Maryland, Virginia, West Virginia, eastern Kentucky and Tennessee, Georgia and Alabama; area, 58,695 square miles.

3. Northern coal-field, part of southern Michigan, 6,700 square miles.

4. The central coal-fields, including the coal-producing areas of Indiana, Illinois and western Kentucky, 47,250 square miles.

5. The western coal-field, including the coal-producing areas of Iowa, Missouri, Nebraska, Kansas, Arkansas, Oklahoma and Texas, 98,700 square miles.

Coal-formations of cretaceous age occur in Dakota, Montana, Wyoming, Utah, Colorado and New Mexico. Coal-formations of tertiary age occur in Washington, Oregon, California and Alaska, but especially in Washington, where the amount of coal is large. The area of the cretaceous coal-fields is probably as great as that of the carboniferous coal-fields. The area of the tertiary coal-fields is not known. The amount of coal in these western fields has not been estimated. It perhaps equals that in the carboniferous system, though the quality of the coal is on the whole inferior.

The anthracite coal of the United States is derived chiefly from Pennsylvania. Colorado and New Mexico, however, produce some. Pennsylvania also leads in the pro-

duction of soft coal. Named in the order of their gross product in 1910, the chief coal-producing states are as follows:

Pennsylvania 225,954,772 (of which 75,433,246 were anthracite); West Virginia 61,671,019 Illinois 45,900,246; Ohio 34,209,668; Indiana 18,389,815; Alabama 16,111,462. The states which produced from fifteen to one million down, in order named, were Kentucky 14,623,319; Colorado 11,973,736 (a part being anthracite); Iowa 7,928,120; Wyoming 7,553,088; Tennessee 7,121,380; Maryland 5,217,125; Kansas 4,921,451; Washington 3,911,899; New Mexico 3,508,321 (anthracite about 20,000); Missouri 2,982,433; Montana 2,920,970; Oklahoma 2,646,226; Utah 2,517,809; Arkansas 1,905,958; Texas 1,892,176; and Michigan 1,534,967. States producing less than one million tons were North Dakota (399,041); Georgia (177,245); Oregon (67,533); California (11,164); and Idaho (4,448). For the fifth time in the history of the United States the production of coal reached in 1910 a total of over 400,000,000 short tons. The bituminous production was 417,111,142 short tons, and the anthracite 75,433,246 long tons. Their value was $629,557,021, showing a considerable increase over the value of the output for 1909 which amounted to $554,668,334.

The chief coal-producing countries outside of the United States are those mentioned in the general table. To this list should perhaps be added India, Nova Scotia and Spain. R. D. Salisbury.

**Coast-Defense.** In 1885 the nation awoke to the fact that the fortifications that should protect our cities and prevent a foe from using our harbors as bases of warlike operations were absurdly weak—in many cases not strong enough to keep out a single line of battleships. Our navy had just been born, and we were without torpedo or other coast-defense vessels. In 1886 about 100 million dollars were appropriated to be spent in 10 years for coast defense; but for many years the matter was greatly neglected. To-day, however, it is believed that our principal ports and harbors are safe from any attack from the sea, even if our navy were driven from the ocean. The defences on the great lakes are comparatively weak, as our treaties with Great Britain prevent either country from maintaining more than a few small vessels upon these waters. The first plans for coast-defense relied largely on vessels of great gun-power and lying very low in the water, so as to offer a small target. These ships were expected to remain in the harbor to supplement the forts. But this type of harbor-defense is abandoned. The coast-defense forts are to all appearance nothing but grassy mounds of earth. The guns for the most part are of the disappearing type, presenting a target to the enemy only at the moment of firing. The latest form of coast-defense is the submarine ship of which we already have a few excellent examples.

**Coast Range,** a mountain range in California, extending from the Oregon boundary into Lower California. It is 30 to 40 miles wide, and is divided by the Bay of San Francisco. From the main range spurs reach out to the coast line, inclosing fertile valleys. The most noted are the Los Angeles, Santa Clara and Sonoma valleys. The highest peak is Mt. San Bernardino, 11,600 feet in height.

**Coast-Survey,** of the United States, is an undertaking of great importance. With a long and dangerous seacoast; with thousands of vessels yearly entering and leaving our ports; and with a great coasting trade, it is the duty of the nation to provide every means which science and skill can offer for pointing out the dangers of the coast. The coast-survey was founded for these objects. It furnishes accurate maps of the whole coast, including Alaska; it points out the site of, or suitable places for, lighthouses and beacons; it traces the ocean-currents along the shores; it studies the tides; it finds out the courses of the winds, the changes which take place at the entrance to harbors, the character of the bottom of the sea off the coast, etc. The first suggestion in the way of organizing a coast-survey was made in Jefferson's message to Congress in 1807; but work was not commenced until 1817. The large scope of the work, its accuracy, the quickness and cheapness with which results have been reached—taking much less time and costing much less than the British survey—have been largely due to its long-time superintendent, the late Prof. A. D. Bache. Besides the valuable scientific knowledge gained, many discoveries of great value to commerce have been made. Thus the entrance to Delaware Bay was found to be eight miles in error. Six dangerous shoals were found in one year near Nantucket, right in the track of trans-Atlantic ships and of the heavy coast-trade between the eastern and the southern states. A new channel, with two more feet of water than any other, was discovered in New York harbor. The reports on the tides and the Gulf Stream were also of the greatest value to commerce.

**Co'balt.** This chemical element has an atomic weight of 59. Its symbol is Co. It is a metal, very tenacious, but not commercially valuable except as the basis of certain brilliant paints, sometimes referred to as cobalt green and cobalt blue. It is often used to color glass blue and in the making of blue porcelains, etc. These colors are derived from the oxides of cobalt. The chloride of cobalt may be used as a sympathetic ink, *i.e.*, an ink which can be made to appear or disappear; for, when

kept moist, the chloride remains invisible; but when dried before a fire, it quickly appears as blue ink. The metal is found pure in meteorites, but otherwise is found only in compounds, usually with arsenic or sulphur. It is not abundant, though widely distributed.

**Cobalt,** a noted mining center in the district of Nipissing, Ontario, Canada, lying just south of the arable lands of Lake Temiscaming. Discovered in 1904, it now has 25 producing and shipping mines, the owners of which have become very wealthy men. In 1904 the camp (largely in the one township of Coleman) produced 158 tons (silver) valued at $136,217; in 1905, 2144 tons valued at $1,473,196; in 1906, 5129 tons valued at $3,900,000. Over 14,000 tons were shipped in 1907 valued at $9,500,000. It is believed that the value of the shipments for 1908 will exceed $10,000,000. The mines are only beginning to be worked in a methodical, scientific way. The Nipissing, the O'Brien, the La Rose and the Coniagas are especially noted for their richness and extent. The district produces other valuable minerals besides silver, including cobalt, nickel and arsenic. Cobalt (the mineral which gives the town its name) is a comparatively rare mineral, used chiefly for coloring glass and fine china and pottery, but also for making paints and pigments. A greater variety of rare minerals has, it is said, been found in the broken reef that runs west from the St. Lawrence than in any other region in the world. Cobalt is 330 miles from Toronto, and is reached by the Grand Trunk Railway via North Bay. From five small veins which have been quite recently opened in an area less than a mile in length and half a mile in breadth, surrounding Cobalt station on the Temiscaming and Northern Ontario Railway, four hundred thousand dollars' worth of ore has been shipped. The records of this railway show 4663 tons of rich ore shipped in 1907. And this wonderful district is only on the threshold of development. In conjunction with the rich finds of silver ore there are found cobalt, nickel and arsenic.

**Cobb, Howell,** born in Georgia in 1815, became a lawyer, and was member of Congress from 1843 to 1851. In 1849 after a debate that lasted three weeks, he was elected speaker. This was a victory for the southern party, that sought to introduce slavery into California, which had been ceded by Mexico to the United States and was about to enter the Union as a state. In 1851 Cobb became governor of Georgia. He presided over the Congress that adopted the Confederate constitution, and on the outbreak of war he became major-general in the army of the south. After peace was declared, he bitterly opposed the policy of reconstruction until his death in 1868.

**Cobbe, Frances Power,** an English reformer, philanthropist and author, was born in Ireland, Dec. 4, 1822. Early in life she devoted herself to relief-work among women and to various reforms, by addresses, lectures and articles in the newspaper and periodical press. She has actively opposed vivisection, and for 18 years was honorary secretary of a society for the protection of animals from vivisection. She has also been a zealous worker in educational and philanthropic projects, and written extensively, from a Unitarian point of view tinged with rationalism, on theistic ethics and belief. Her chief writings embrace *Studies, Ethical and Social; Intuitive Morals; Religious Duty; Hopes of the Human Race; Duties of Women; Darwinism in Morals; A Faithless World; The Scientific Spirit of the Age;* etc. Her autobiography appeared in 1894, and her death occurred in 1904.

**Cob'den, Richard,** "the apostle of free trade," was born at Heyshott, England, June 3, 1804. After five miserable years in a "Dotheboys school," he was given a position in his uncle's wholesale warehouse in London. After setting up for himself in the calico-printing business, he settled at Manchester in 1832. He was an energetic member of the Manchester Anti-Corn Law League, which opposed all duties on corn [wheat]. Becoming a member of Parliament, his speeches in the house and lectures throughout the country had great effect in bringing about the repeal of the corn-laws in 1846. In politics he was against the Crimean War, declined to serve under Palmerston as president of the board of trade, and arranged the treaty of commerce with France in 1860. Throughout his life he was earnest and simple-minded. In Parliament he was the master of clear, persuasive speech, and was the champion of free trade, peace, non-intervention and economy. He died on April 2, 1865.

**Coblenz** or **Koblenz** (*kō'blĕnts*), a city of Prussia, at the junction of the Rhine and the Moselle. It is strongly fortified by a wall and a series of forts, especially the castle Ehrenbreitstein, which was built by Emperor Julian and is deemed almost unassailable. The defensive works will shelter 100,000 men, though 5,000 are deemed enough to defend them. The magazines are designed to hold provisions for 8,000 men for ten years, and the cisterns to hold a three years' supply of water. The old church of St. Castor, built in 836, and its palace are the chief features of the city. Its main trade is in champagne and cigars. Coblenz became a part of Prussia in 1815. Population, 53,897.

**Cobourg** (*kō'bo͝org*), a favorite summer resort, 70 miles east of Toronto on Lake Ontario. Population, 5,000. Some beautiful homes have been erected by wealthy Americans who spend the summer there.

Its public buildings, churches, banks, schools and hotels are unusually attractive. It is the best harbor on the north shore of Lake Ontario. The Grand Trunk Railway has a daily ferry-service to Rochester, New York.

**Cobra de Capello** (*kō'brà dā kà-pĕl'lō*), the hooded snake of India, the most dreaded of the serpent tribe. Its poison fangs stand out, not like those of the rattlesnake at the time of striking, but permanently. There is a more venomous snake in India, but the cobra is more abundant and is extremely poisonous. About 25,000 deaths occur annually in the Indian peninsula from cobra bites. Its usual food is small reptiles, frogs, fish, etc., and it may climb to roofs or among branches or take to the water in search of food. Its natural enemies are the jungle-fowl, which devours the young, and the ichneumon, which can overcome the full-grown animals. When excited, the hood (see illustration) is expanded by dilating the neck. The colors of this serpent vary from brownish olive to black, with white or black spots (usually two) on the hood. The natives hold it in superstitious reverence, and it is a favorite with the snake-charmers of India.

COBRA

**Cochin-China** (*kō'chĭn chī'nà*), the maritime region of Anam, an Asiatic possession (since 1861) of France, lies along the east coast of Indo-China, washed by the China Sea. The area of the whole of the Indo-Chinese dependencies of France is about 255,000 square miles, with a population of 18 1-4 millions. It is divided into four main parts: Tonquin in the north, south of it Anam proper, south of Anam, Cochin-China proper, and in the far southeast, Champa. The capital is Hué. The delta-lands of Tonquin are very fertile, yielding two harvests a year. They are formed by the red soil carried down by the main river of the country, the Song-coi, which is rapidly enlarging the delta. Hanoi, a seaport built by the Chinese in the 18th century, is now 100 miles inland. Everywhere the delta-lands are crossed by deep dikes, many miles in length, from 20 to 30 feet high, and broad enough at the top for three carriages to drive abreast. The people of the hills are taller and stronger than those of the coast, who are small and so inactive that "lazy as an Anamese" has become a proverb. The great crop is rice, which is also the main food, though the people are fond of snakes, locusts, rats and dogs. The emperor is a despot, and the bastinado, mutilation and torture are regular punishments. All men between 18 and 60 must serve in the army, and the field-work is usually left to the women.

Cochin-China, which has an area of 23,160 square miles, was conquered by China in 214 B. C., gained its independence in 929 A. D., and was successful in a second war with China in 1403–28. In 1517 came the Portuguese, and soon after the Dutch; in 1789 appeared the French, who have slowly made themselves masters, so that now the whole country is a dependency of France. The capital is Saigon, and the chief products are rice, cotton, silk, hides, fish, pepper and copra. Population is about 2,226,935, and the population of Saigon the capital is 47,577. See ANAM and CAMBODIA.

**Cochineal.** A dyestuff, made from the cochineal insect, scarlet or crimson in color. From the same source are derived the carmine and lake paints or pigments. Of late years this coloring matter is of less importance, because of the use of aniline dyes which are prepared cheaply by chemicals from coal-tar. The home of the insect is Mexico and Central America. It is very small, a pound of cochineal containing about 70,000 dried insects. It feeds on the cactus, and is secured by taking branches of that plant and giving the females an opportunity to lay their eggs. These little eggs are hatched in enormous numbers, and when this second generation of insects is just ready to lay the little creatures are gathered in trays and placed in a hot oven. They are later dried thoroughly in the sun. From the dead bodies 10% of pure dye is secured. The insect has been successfully introduced into Java and Australia.

**Cockatoo,** any member of a family of parrot-like birds inhabiting the East Indian archipelago, Guinea and Australia. There is in most species a crown of feathers on the head, which are raised when the bird is excited, but quite smooth when it is quiet. The birds live in flocks in the tops of tall trees, and make a note sounding like their name, but they are also great screamers. They are very common in zoological gardens. The prevailing color of plumage is white, but there are a yellow-crested and a pink-

LEADBEATER'S COCKATOO

crested cockatoo, the latter with feathers pink above and almost crimson below. There is also a black cockatoo.

**Cock'rell, Francis Marion,** a member of the U. S. senate, was born in Johnson County, Missouri, in 1834. He practised law, served in the Confederate army during the Civil War, and attained the rank of brigadier-general. As a senator he was quite prominent upon committees dealing with appropriations, military affairs and industrial expositions. He was appointed on the inter-state commerce commission in 1905. He died in 1915.

**Cockroaches.** The cockroach or roach is a member of the order *Orthoptera* or straight-winged insects, and is thus closely related to locusts, grasshoppers and crickets, rather than to beetles. Fossil roaches are found in such numbers in the lower coal-beds as to suggest that they were the most common insects during that warm moist period of the earth's history. They still follow warmth and moisture, and for this reason have attached themselves to man. There are four species that especially infest our houses, the German, the American, the Oriental and the Australian.

They are smooth, brownish insects, broad and very flat-bodied, which enables them to spend the day between boards or otherwise hidden. The head is bent under the body, and the eyes turn downward. The antennæ or feelers take the place of noses and ears, apparently, and are very long, about the length of the body and very slender, having 100 or more joints. The males commonly have two pairs of wings. The female commonly has shorter wings or none at all. They come out to feast by night. So greedy are they that they have been known to bite through book covers and gilt lettering so as to get at the paste beneath. They leave an offensive odor on all over which they pass, and even flavor dishes so that the odor becomes perceptible only when the food cooked therein is tasted.

Though roaches are excellent scavengers and are reputed to destroy bed-bugs, they are so disgusting that it is important to unite in their destruction. They will invade a house which is free from them, so that concerted action is necessary. They are on their guard against most poisons, but can to a great extent be destroyed by the use of pyrethrum powder. This, however, spoils the shelves on which it is placed, and the roaches are only paralyzed by it in many cases, and must be swept up and burnt in the morning, before they recover. Phosphorus paste, of which many preparations are sold under patents, is destructive to roaches, but is troublesome and not free from danger. Wherever a room can be made airtight, *fumigation* by burning pyrethrum is very effective.

**Co'coa,** a substance obtained from the seeds of *Theobroma Cacao*, a member of the *Sterculia* family. This particular species is native to tropical America. The cucumber-like fruit contains numerous seeds which are called cocoa beans. From these beans the cocoa is obtained, and in its refinement it appears in commerce under the name of chocolate.

**Co'coanut,** a species of the genus *Cocos* (*C. nucifera*), belonging to the palm family. It is native to certain islands of the Indian Ocean, growing naturally on the sea-shore or in its immediate vicinity, but cocoanut plantations are common throughout the tropics. A tough fibrous husk incloses the nut, whose hard shell is lined with the food-material. The so-called milk in the large cavity is simply tissue which has not developed into compact cells. Not only is the fruit itself an article of commerce, but the oil extracted from the nuts, which is known as cocoa-

COCOANUT PALM WITH FRUIT

butter. This is one of the tallest and most ornamental of the palms, the columnar trunk sometimes rising to a height of 100 feet and being crowned by a cluster of leaves from 10 to 20 feet long. As a rule it is found near the sea-coast. The tree begins to bear fruit when about eight years old; the average annual yield is from 90 to 100 nuts; and the tree remains productive many years. The embryo finds outlet in the largest of the three black scars at one end of the shell. The cocoanut is propagated only by seeds.

**Cocoon** (*ko-kōōn'*). See CATERPILLAR.

**Cod,** a common salt-water food-fish related to the haddock. The average weight of those taken about Cape Cod is about ten pounds, but they may reach the exceptional weight of one hundred and sixty pounds. One weighing 60 pounds is considered a large fish. They live in the cold waters of the north-temperate seas, and extend into the Arctic Circle. They are remarkable eaters; not only do they eat very many fish, but they swallow shelled mollusks whole, and rare shells have been collected from the cod's stomach. They

Courtesy of Bulletin of Pan American Union

A COFFEE PLANTATION IN COSTA RICA.

Showing trees twenty-five feet in height. In most large plantations they are allowed to grow not more than ten feet high. The broad leaves here seen are those of a banana tree.

Courtesy of Bulletin of Pan American Union

YOUNG COFFEE TREES IN BLOOM.

The blossoms are something like the jessamine in form and scent. The blossoms last only about three days. The rich fragrance can be detected by incoming voyagers three miles from land. The coffee trees begin to bear two to four years after they are transplanted from the nursery.

Courtesy of Bulletin of Pan American Union

A COFFEE PLANTATION IN BRAZIL.

In the single state of São Paulo, Brazil, there are growing 700 million coffee trees, producing annually about three-quarters of the world's coffee crop. Miles and miles of coffee trees stretch away as far as the eye can reach.

Courtesy of Bulletin of Pan American Union

NEAR VIEW OF COFFEE TREE SHOWING FRUIT

When ripe the fruit is red, and looks something like a cranberry. The coffee we buy is the seed of this berry. There are usually two seeds in a berry. Under the outer skin is a sticky pulp which incloses the seeds or beans, and these beans are coated with a coarse husk called "parchment," and under this is a very thin jacket known as the "silver-skin."

Courtesy of Bulletin of Pan American Union

PICKING COFFEE IN BRAZIL.

The berries are stripped from the boughs by hand and, with many leaves and twigs, let fall to the ground. Then they are raked together, the leaves and twigs separated, and the berries packed in sacks. After being washed clean the berries are carried in water to the pulping machine which crushes and loosens the pulp. The wet mass of beans and pulp then passes through a perforated revolving cylinder which separates the beans from the pulp. This is what is called the "wet system."

Courtesy of Bulletin of Pan American Union

DRYING GROUNDS.

After passing into a fermentation basin, where any bit of pulp remaining is loosened and washed out, the beans are carried to the drying grounds. These are paved with brick or tile on which the beans are spread. Here constant watch and care are required, the beans being stirred to give uniform heat and ventilation, so that they do not dry too rapidly or too slowly.

Courtesy of Bulletin of Pan American Union

CLEANSING.

When dry the beans are taken to the machine for cleaning and hulling. A blower carries off the dust; then in the hulling machine the beans pass between corrugated surfaces, where by friction the inner coverings are loosened, and a second blower throws out the hulls and dust. By machinery the beans are then sorted as to size and weight, and from the last machine they fall into bags for shipment.

Courtesy of Bulletin of Pan American Union

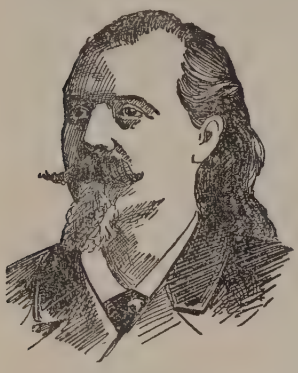
PREPARING FOR SHIPMENT.

This is a scene in a shipping warehouse in the port of Santos, Brazil. The coffee is being weighed and made ready for loading on the steamers for shipment to Europe and the United States. For miles the docks of Santos are lined with steamers, flying the flags of many nations, all waiting to load coffee.

lay an immense number of eggs—as many as 9,000,000 from a 75-pound fish. The cod are caught with hook and line, and great numbers are salted as food. Cod-liver oil is a well-known medicine.

**Codlin-Moth** (*Carpocapsa pomonella* of Linnæus), according to Comstock "the best known and probably the most important insect-enemy of the fruit-grower," is gray with bronze markings, and has a wing-spread of less than an inch across. The eggs are laid in the middle of the blossom, and hatch into tiny maggots, which eat to the center of the young apple. When the apple drops, as it does prematurely, the grown larva crawls out and into the ground. Later it spins its cocoon under the scales of the bark of the apple-trees. Large numbers are destroyed while in this stage by woodpeckers. The larvæ of the second brood are carried late in the fall to where apples are stored for the winter, and live to the next spring. It is estimated that this moth causes $7,000,000 damage yearly in Illinois, Nebraska and New York. Preventive: Paris green or lead arsenate sprayed on the trees just as the blossoms fall, with a repetition of the treatment in a few days if rainy weather follows. (See SPRAYING.)

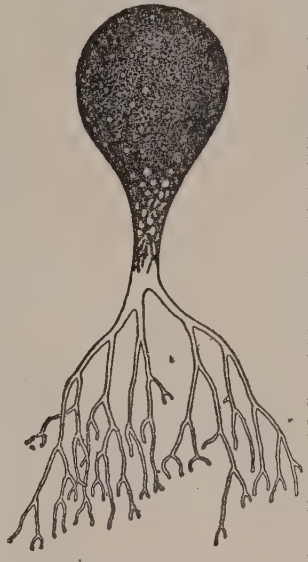
**Cody, William Frederick,** an American frontiersman and scout, was born in Iowa, Feb. 26, 1846. He was familiarly known as Buffalo Bill, having earned the sobriquet by having killed, in 18 months (1867-8), over 4,000 buffaloes on the plains, to feed the laborers engaged in the construction of the Kansas Pacific Railroad. He for some time in 1868-72 acted as government scout and guide, and served in the field-operations against the Sioux and Cheyennes. In the battle of Indian Creek he killed Yellow Hand, the Cheyenne chief, in a hand-to-hand fight; and was also in the battle of Wounded Knee. In 1872 he was a member of the Nebraska legislature. In 1888 he organized what was known as the Wild-West Show, an exhibition of Indians, rough-riders, cow-boys and frontiersmen, with whom he made tours of the chief towns of the United States and Europe. He is a joint author of *The Great Salt Lake Trail.* He died Jan. 10, 1917.



W. F. CODY

**Cœlenterata** (*sē-len'ter-ā' tă*), the subkingdom of animals containing the hydra, sea-anemone, jelly-fish and coral animals. With the exception of the fresh-water hydra and a rare jelly-fish, they all inhabit salt water. There are several types of animals embraced within this subkingdom. The hydroids are colonial and branching. They have often been collected and pressed under the name of sea-moss. The polyps or individuals living on the branches are of two kinds: the feeding and the medusoids. The latter are modified polyps. When mature, they resemble jelly-fish and are set free, swimming about independently. They bear the eggs and sperms. When the eggs develop, they are converted into the branched colonial forms and as a consequence, there is an alternation of generations. The medusoids lead naturally to the jelly-fish, which are free swimming and of diversified form. Many of them have an umbrella-shaped disc with tentacles and other structures hanging from it. Formerly they were called medusæ. The coral-animals are both solitary and colonial or branching. All of these animals have lasso-cells, containing minute darts or threads which are capable of being discharged. In some forms they are long enough to penetrate the human skin, and these can inflict severe stings. The *Ctenophora* or comb-bearers make a separate class. See CORAL, HYDRA, JELLY-FISH,

**Cœnocyte** (*sē'no-sīt*), a plant body which contains no dividing walls, but consists of a single body cavity surrounded by the general bounding wall. Such bodies contain numerous nuclei, and may be regarded as being composed of just as many cells, which have not formed walls about themselves. The cœnocytic body is chiefly displayed by the siphon forms among the green algæ and by the *Phycomycetes* among the *Fungi.*



BOTRYDIUM, SHOWING A CŒNOCYTIC BODY

**Coffee,** the seed of the coffee-tree and also a well-known drink made from the same. The coffee-tree is a native of Abyssinia, Arabia and many parts of Africa.

It is extensively grown in Brazil and other northern states of the South American continent, as also in Mexico, Central America, Haiti, San Domingo and the East Indies. In a wild state it is a slender tree from 15 to 25 feet in height. When grown in plantations, it is not allowed to become more than six to ten feet high, with many branches. The fruit is dark scarlet when ripe, with two cells, having one seed each. The leaves are evergreen, and the flowers white. The coffee-tree thrives best in warm, moist lands; though it grows at Quito, Peru, at an altitude of 1,000 feet, where there never is any frost. The tree yields its first crop in the third year; from a full-grown tree, its yield may amount to a pound of coffee-beans. Three gatherings are made in the year, when this process takes place: The beans are placed on a mat to dry by the sun's rays; the pulp and skin are taken off by rollers; and the coffee is cleaned by winnowing. The main difference in price and quality of the product is due to care bestowed in preparing it in different places. The chief kinds are Mocha, a small, grayish-green bean; Java, a large, yellow bean; Jamaica, smaller and greenish; Rio, pale-yellow and whitish. Rio and Maracaibo are the cheaper, and Java, Mocha and Sunda are the more expensive brands. Coffee allays hunger, exhilarates and refreshes. According to some authorities it also lessens the amount of wear and tear of tissue in the waste in the animal frame which is going on every moment. The consumption of coffee in the United States in 1910 was 873,983,689 pounds, an average of 9.33 pounds *per capita*, and the average import-price per pound was 7.9 cents. More than half the world's coffee is produced in Brazil.

COFFEE-PLANT

**Coffee Republic.** See COSTA RICA.

**Coffer-Dam** is a temporary dam built around a place to be excavated for a foundation, so that the water can be kept pumped out. It is commonly constructed by driving piles about the given area and using sheathing of various kinds to make a water-tight wall. Coffer-dams are not ordinarily used in water over 25 feet deep. For deeper water caissons are used. See CAISSON.

**Cohoes** (*kō-hōz'*), a flourishing, manufacturing city in New York state, on the Hudson, at the mouth of the Mohawk, and also on the State Barge Canal. It has six large cotton-mills, and some 30 knitting-mills with a number of other factories. Population, 24,709.

**Coin and Coinage.** See MINT.

**Coke,** a fuel got by heating coal in confined places. This is done sometimes in heaps, just as charcoal is made from wood, but oftener in ovens. It is also made when coal-gas is manufactured, being left after the gas is driven off. Coke is a hard, brittle, porous solid, with a steel-gray glint, and it does not readily soil the hands when handled. It is mainly valued for the great heat it gives off and its freedom from smoke when burning. Moreover, it does not become pasty in the fire while some of the sulphur of the coal is driven off; all these qualities make it very useful in smelting and refining metals. Coal yields about 70 per cent. of coke.

**Colbert** (*kōl'bâr'*), **Jean Baptiste,** one of the greatest of French statesmen, was born at Rheims, France, in 1619. In 1651 he entered the service of the great minister Mazarin. On his deathbed Mazarin warmly recommended Colbert to Louis XIV. "I owe you everything," said he, "but I pay my debt to your majesty by giving you Colbert." It was in 1661 that Colbert became chief minister to Louis XIV. He at once began to improve the ruinous condition of the finances. So thorough was the change which he brought about, that in ten years the yearly revenue (net) was 77,000,000 livres, when before it had been only 32,000,000 livres. But his reforms did not stop here. Farming, business, roads, canals and French colonies all felt his energetic hand. He found France with a few old rotten ships, and in a few years provided her with one of the strongest navies in the world. He also was a friend to all men of learning. In short, Colbert was the patron of industry, commerce, art, science and literature, the founder of a new epoch in France. His aim was to raise the power of France; but all he accomplished was undone by the wars of Louis and his spendthrift court. He died at Paris in 1683.

**Col'borne, Sir John,** born in England in 1788, was educated at Christ's Hospital (the Bluecoat School) and Winchester College. He entered the army in 1794 and saw active service in Egypt, Sicily, Portugal and elsewhere. In 1828 he was appointed lieutenant-governor of Upper Canada (now Ontario). Greatly interested in education, he founded Upper Canada College which has for many years been one of the most important educational institutions in Canada. Owing to the agitation by William Lyon Mackenzie his term of office was one of stress and storm. He later became administrator of Lower Canada and suppressed the Papineau rebellion. He was subsequently made governor of the Ionian Islands, and later attained the highest military rank, that of Field-Marshal. As Lord Seaton he died in England in 1863.

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1—Coffee Branch, showing Fruit and Blossom. 2—Single Blossom. 3—Fruit. 4—Cut Fruit. 5—Tea Branch showing Blossoms. 6—Fruit. 7—Cocoa Branch, showing Fruit. 8—Opened Fruit. 9—Blossom. 10—Hops, Male Plant. 11—Male Blossom. 12—Female Plant. 13—Fruit. 14—Minute Grains (greatly enlarged) at base of petals. 15—Catkin of Female Flower. 16—Tobacco Plant. 17—Flower. 18—Fruit.

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1—Blossom. 2—Fruit. 3—Fruit; shell split. 4—Seed. 5—Olive Fruit. 6—Blossom. 7—Fruit; cut lengthwise. 8—Seed. 9—Blossom. 10—Blossom; cut lengthwise. 11—Fruit. 12—Branch of Blossoms. 13—Blossom of Female Tree. 14—Fruit. 15—Fruit; cut in half. 16—Branch of Oil Palm Fruit. 17—Branch of Male Flowers. 18—Single Fruit. 19—Single Male Flower. 20—Single Female Flower.

**Cold Harbor,** a village in Virginia, nine miles northeast of Richmond, where a bloody battle was fought, June 3, 1864, between the Federal army under Grant and the Confederate army under Lee. Lee held a strong position, having his entire line covered with earthworks. In the early morning the Federal line advanced in a grand assault on the Confederate works. They were obliged to pass over a naked plain covered by the Confederate guns. Bravely and swiftly they advanced, only, however, to be swept down by the enemy's fire. In less than an hour after the first volley was fired 6,000 Union soldiers lay on the ground dead or wounded, and the assault failed. The attack was not renewed, and at night Lee, in turn, assaulted the Federal lines, but was repulsed.

**Cold Storage.** Food may be preserved either by some chemical change made in it or by keeping out the bacteria of decomposition or by cold. The first method, which includes smoking and the use of large quantities of sugar, has the disadvantage of making the food less wholesome. The second method depends upon the fact that bacteria are kept out with the air, and requires that the bacteria present in the food or vessel be first destroyed, usually by prolonged boiling. By this method the food loses taste, in most cases. Cold storage depends upon the fact that below a certain temperature the bacteria of decomposition cannot work, though they may continue alive. A mammoth's flesh was preserved in the snows of Siberia for probably 20,000 years or more; and when found the dogs ate the flesh. Cold storage is the best method of preserving food. In 1867 the first refrigerator-car ran from Chicago to New York with a load of beef; it was a success, and enormous quantities of meat are now sent east in this way. The butchers in New York and other cities are able by the same method to keep the meat a long time after receiving it. Meat is now sent across the Atlantic in cold storage, especially to England, thus saving the expense and the risks of sending live animals. For about 25 years mutton has been sent in ever-increasing quantities from New Zealand and Australia to England by cold storage, with excellent results to all concerned. Fruits are now sent in refrigerator-cars from California and the south to all parts of the country. Bananas are thus packed, and the heat regulated on the journey, so that the bananas arrive at their destination at just the required degree of ripeness; for cold prevents ripening as well as decay. The cars are built double, with ice at each end, and a fan turned by the forward motion of the car keeps the air circulating over the ice to the meat and back again. The art of cold storage was neglected until the American people developed it into a great industry and common practice.

**Cold Wave.** From time to time great masses of air that have been chilled by the cold soil of northern Canada flow southward over the United States. Such cold waves, as they are called by the United States weather-bureau, usually cause a sudden fall in the temperature to the extent of at least 20°. The mass of cold air, being dense, usually lies near to the surface of the ground. It pushes its way beneath the less dense air of the south, which curls and rises away before it. The clouds which mark the advance of a cold wave, and often bring snow, seem to be caused by the cooling of the southern air, so that it can no longer contain so much water-vapor. A cold wave will sometimes reach even Mexico, where it is known as the *Norte*.

**Cole, Thomas,** an American painter, was born at Bolton-le Moors, England, Feb. 1, 1801. At Steubenville, O., where his father settled after emigrating to America, the sight of a wandering portrait-painter, with his canvas and colors, made him decide to become a painter. He painted portraits in several Ohio cities with no success, after which he set up as a landscape-painter at Philadelphia in 1823. Here he had a hard time, glad even to ornament chairs for a living. But in 1825 he painted several landscapes from sketches he had made in the Catskills, which gave him a name among artists. Prosperity at once followed and never afterward forsook him. Among his finest pictures are *Mt. Ætna*, *View of the White Mountains* and *The Voyage of Life*, the last a series of four pictures representing childhood, youth, manhood and old age. He died at Catskill, N. Y., Feb. 11, 1848.

**Coleridge** (*kōl'rĭj*), **John Duke, Lord,** son of a nephew of the poet, was born in 1820, and graduated at Oxford. He sat in Parliament from 1865 to 1873, where he was solicitor-general and attorney-general under Gladstone. In 1880 he became lord-chief-justice of England. He died on June 14, 1894.

**Coleridge, Samuel Taylor,** an English poet, was born at Ottery St. Mary, England, Oct. 21, 1772. At the age of four he had read the *Arabian Nights*. Schooled at Christ's Hospital, where he was poorly fed and badly taught, he afterward became a wide reader, reading Homer for the mere fun of it; and here he had as a schoolcomrade Charles Lamb. Here he planted the seeds of his after ill-health by bathing in the river with his clothes on, and then joining in a game or reading without changing his garments. Entering Cambridge, he was known as a great talker, a gift in which he excelled throughout life. Careless and extravagant, he was so exercised over his money troubles, that he fled and enlisted

in a dragoon-regiment under a false name. Later he was discovered by his friends and sent to Oxford, where he met Southey. In 1795 he lectured and even preached in the Unitarian chapels around Bristol, and founded a short-lived journal. Coleridge and Wordsworth early became fast friends, spending much time together. Their talks on poetry led to their jointly bringing out the *Lyrical Ballads* (1798), containing Coleridge's *Ancient Mariner*, and the little book marked a new departure in poetry. A year later appeared his translation of *Wallenstein*, one of his best bits of work. During these years, troubled with rheumatism and neuralgia, he began to use opium, and the habit grew and enslaved him. It ruined his health, was fatal to his imagination, and weakened his will. Very sad is his lament over his own decay in his beautiful ode on *Dejection*. He had before contributed to the London journals, and now began to issue a weekly paper, *The Friend*, which, however, lived but a few months. As a poet and philosopher Coleridge ranks high; while as a critic he is unsurpassed. Besides his poems, his finest works are, perhaps, *Biographia Literaria* and *Aids to Reflection*. He wrote but little poetry, but that little deserves to be printed on purple vellum and bound in covers of gold. He died at London, July 23, 1834.

**Colfax** (*kōl'făks*), **Schuyler,** a vice-president of the United States, was born at New York, March 23, 1823. Removing to Indiana, he published a newspaper at South Bend, which he made the foremost Whig journal in the district. Chosen a representative to Congress by the newly-formed Republican party, in 1854, he remained a member until 1869 and was three times speaker. He was elected vice-president on the ticket with Grant in 1868. He died on Jan. 13, 1885.

**Coligni, Gaspard de** (*dŏh ko-lēn'yē*), a French general, was born Feb. 16, 1517. A soldier at 22, he fought bravely in the wars against Spain, and was made general of infantry by Henry II. In 1552 he was made admiral of France, though he never commanded on the sea. In 1557 he stubbornly held St. Quentin, with a handful of men, for 11 days against the Spanish army, and, though all hope of defending the town was gone, he refused to surrender and was captured, fighting desperately at the head of a few soldiers. This defense saved France from being overrun by the Spaniards. Imprisonment followed, during which he became a Huguenot. As able a statesman as he was a soldier, he succeeded in outwitting the Guises and securing for the Huguenots freedom of worship. The bad faith of the queen-mother, Catherine dei Medici, brought about the second Huguenot war, in which Coligni was chief commander of the forces of Henry of Navarre, afterward Henry IV. When peace was concluded, Catherine took advantage of the marriage of Navarre with the sister of Charles IX, the king, to order the massacre of St. Bartholomew (1572). Its chief victim was Coligni, who was murdered in his bed, at Paris and his body thrown into the street. Personally, Coligni was one of the noblest Frenchmen of the 16th century and had a profound love for his country.

**Colleges, American.** The course of study in our American colleges has been constantly enlarging and widening. The knowledge required for entering has also risen greatly, so that now colleges proper—as distinguished from the many high-schools and academies calling themselves colleges—furnish young men with an education fully equal to that of the undergraduate departments of English and German universities. The high conditions of admission are shown by the fact that 15 per cent. of the candidates for the freshman class at Harvard fail to pass the entrance examinations, while ten per cent. fail each year at Yale. Besides the regular course, almost all colleges offer the student, especially in the last two years of the course, elective studies, which, if he prefers, he can exchange for studies in the regular course. Training in writing and public speaking is also carried on, either under the direction of the faculty or in the exercises and debates of the literary societies and in the editing of college papers. Elective studies as a system were not introduced into Harvard till the accession of President Eliot (1869). They have since been widely adopted in other colleges. A student's expenses of course vary greatly. In city-colleges, like Yale, Harvard and Columbia, the extremes are from about $450 to $3,000 a year. At the country colleges of the east, a poor student's bills need not be more than $350, while at the smaller western colleges they may be still less. Moreover, all colleges grant aid to poor students of good brains, while teaching and tutoring or "coaching" often pay the whole of a student's expens s. Harvard bears the name of a Congregational clergyman. Princeton was founded to train up able ministers. And in fact, all the early colleges were founded for a like purpose. Many western colleges w re also started as home-missionary sch ols. The aim of colleges has since greatly widened; yet college-professors to-day are in the main Christian men, and the influence in colleges on student and on the cou.try is a Christian one. One feature of college life is its student-societies, open—most of them literary—and secret. These societies are often known as fraternities, with chapters in many colleges. In 1908 there were 32 men's fraternities in connection with American colleges, with 1,013 active chapters and a total membership of 198,507; in

the same year there were 17 women's fraternities, with 254 active chapters and a total membership of 22,833.

Athletics receive their full share of attention. Each college, usually each class, has its baseball-nine, football-eleven and boat-crew. Series of games are played with other colleges each year The Thanksgiving Day football game between Yale and Princeton, which for years was played in New York city. drew thousands of spectators, as does also the spring regatta between the Harvard and Yale crews. which is rowed on the Thames, at New London, Conn. Field-days, in which prizes are given to the winners in running, jumping, vaulting and other matches, are held in most colleges. Over half the colleges of the country have gymnasiums, and in at least one—Amherst—exercise under an instructor is required. The Dartmouth *Gazette* was the first college paper, founded in 1800. The Harvard *Lyceum*, which was begun in 1810, had Edward Everett as its first editor. Such men as Oliver Wendell Holmes, James Russell Lowell and Phillips Brooks were college editors. There are now over 200 college journals. Many colleges now give fellowships to specially able graduates to study in some special branch, usually abroad. The most prominent in this respect is Johns Hopkins University. The colleges of the country—some 500—are well-distributed. The largest, as a rule, are in the east. The University of Wisconsin at Madison, Wis., the University of Illinois with 4,920 students, the University of Chicago with its 3,035 students and the University of Michigan at Ann Arbor, Mich., with its 297 professors and lecturers and 5,500 students, are among the more prominent western colleges. The oldest college in the country is Harvard at Cambridge, Mass., with 597 instructors and its 4128 students. Yale, Princeton, Amherst, Dartmouth, Bowdoin, Brown, Cornell, Columbia, Lehigh, Lafayette, the University of Pennsylvania and Williams are the other leading eastern colleges. Most of the colleges will be found mentioned under the name of the town where they are located. The total number of students of both sexes attending the 453 American colleges in 1908 was close upon 200,000, about one fourth being women. The number of instructors was over 18,000, 2,250 being women. The benefactions of the year amounted to nearly 15 million dollars, and the total income was over $30,750,000; while the gross productive funds amounted to 208¾ millions.

**College Entrance-Examination Board,** of the middle states and Maryland, was established in 1899 at the instigation of Nicholas Murray Butler to obviate the difficulties arising from the diversity of standards of admission required by the various colleges and universities throughout the country. It is composed of representatives of colleges and secondary schools in the Middle States and Maryland whose duties are to hold yearly a series of college entrance-examinations with uniform tests in the various subjects and to issue certificates based upon the results of these examinations. The examination-papers for each subject are made out by a committee of three (two college professors and one high-school instructor), and then revised by a committee made up of the original three members, together with five additional high-school teachers. The papers are then sent to the places where examinations are held, which now include nearly all the larger cities in the United States, and some cities in foreign countries. No candidate fails, unless judged unfit to pass by at least two examiners. The certificates issued by the board are now accepted by nearly all colleges of the United States. Pupils who fail may have their examination papers sent to the college which they wish to enter, and, if their standing is satisfactory to that institution, they may be admitted.

**College, Going to.** To raise the question whether or not one should go to college is much like questioning the advisability of one's doing much reading and thinking. There are, for various reasons, many persons from whom only a minimum amount of mental activity can be expected, and a meagre education must suffice for them. But, ordinarily, any one who finds it possible to go to college, or who has energy enough to make it possible, can profit greatly by going.

It is true that occasionally a successful, or even a college-bred, man opposes a college-course for his son, on the ground that such a course unfits one for business instead of helping him in it.

But, in general, one vital condition of success in life is a knowledge of what people have thought and done in the past: a knowledge of the principal problems that have confronted them and the ways in which they have been solved. This is one of the things that a good college-course attempts to give, and does give. It gives it in the study of literature, history, natural science, art and other subjects, the various studies representing nothing more than the main lines of human endeavor.

The college-course accomplishes this object much better now than it did 25 years ago. At that time nearly all students were expected to take much the same course, consisting of Latin, Greek and mathematics, no one of which subjects dealt extensively with the actual problems of life. But since that time many subjects have been introduced, such as sociology, domestic science, domestic art, manual training and educational psychology, be-

cause they deal with real issues; and most of the old lines of study have been so modified in content and method that they function much more than formerly. Therefore, as a result of a good college-course, to-day, one becomes reasonably well-informed in regard to modern problems, and he has such an interest in them that his mind is likely to be alert and active in regard to these and other problems in the future. He is then well-prepared to be identified with the workers of the world.

All this applies as well to college-education for young women as for young men. It is true that it used to be a question whether the ordinary college-course for young women, while it possessed many merits, did not to a considerable extent inculcate a distaste for home-keeping—a sad result, indeed. It tended to do this through neglect of the problems of the home, if in no more positive way. But that evil is now being rapidly remedied, just as are the somewhat similar but lesser evils in the men's colleges.

But knowledge of and interest in human problems are only some of the benefits of a college course. Any one who spends three or four years at college forms there many of his main friendships for life. It is an especially cultured, ambitious and able class of persons that one meets in college; and to cement enduring friendships there that one will often enjoy later is one of the chief objects of going to college. Many an adult suffers from lack of numerous well-educated and close friends. The suggestion follows from this fact that study should not be taken so seriously as to exclude social life at college.

The college-graduate, to be sure, is likely to feel his lack of preparation for most lines of work, the moment he leaves college and sets out to earn a living. He must often at first take a position much inferior to those occupied by other persons possessing little education. But his superior knowledge, training and associations give him innumerable advantages over such persons in the race for advancement, and usually, before many years are passed, he passes beyond them. He not only occupies a higher position in his chosen work, too, but he takes higher rank as a factor for progress in community life.

The selection of a good college is not an easy matter. A college that is very good for one person may not be desirable for another. Large colleges or universities possess the advantage over small ones of having more valuable equipments and of paying larger salaries to head-professors. But the difficulty with the large college is that the average student who attends it becomes lost in the mass. The lecture-plan is largely followed, and the classes are large, so that few responsibilities besides getting his lessons fall upon the ordinary student, and he has little or no personal contact with his instructors. Many of these, also, are poorly paid underlings, the head-professors, worth large salaries, working mainly with advanced students.

The small college, on the other hand, is very likely to secure a close contact between teacher and student, and each student is likely to feel more social responsibility. The difference is much the same as that between life in a great city and that in a small town. Any person having any vigor is likely to count for something in a small community; while only the born leaders are called forth in great cities. Many enlightened persons to-day are inclined to favor the small, reasonably well-equipped college to the very large one for the ordinary student.

But the college that one chooses should depend very much upon its strength in the line of study that one expects mainly to pursue. Moreover, whatever college one attends, the courses that he selects after he arrives there should not be determined solely by their titles. In fact, one should not choose a college chiefly either because it is small or large, but because there are certain persons of power there whom he wants and can have as his own instructors. The average instruction in any school or college is not very good, and frequently it is very poor. This is not due to any carelessness on the part of any class; it is true because good teaching is so difficult an art that it is not common. Not infrequently professors with national reputations are miserable instructors. They can attract students, but cannot hold them. In choosing a college, therefore, one should make sure, by correspondence with friends and in other ways, that his prospective teachers will be a source of inspiration. It makes little difference how learned the faculty as a whole is, or how many members it may contain; the very few men who will instruct a given student are practically the institution for that particular student.

The principal of the high-school nearest to you can probably be relied upon to give good advice about particulars in regard to going to college. By writing to the secretary of any college one can obtain desired information, including the catalogue of the institution. See, also, COLLEGES, AMERICAN.

F. M. McMURRY.

**College of the City of New York.** In 1847–8 the city board of education established an institution for higher education which was at first known as the New York Free Academy. In 1866 it became a college, but it had no separate board of trustees until 1900, when the members of the board of education were replaced by the president of that board, acting with the president of the college and nine members

chosen by the mayor. The college is now housed in splendid four-million-dollar buildings. A notable feature of its recent development has been its co-operation with the city. For example, the Department of Chemistry works with the municipal testing laboratories in the analysis of products purchased, with the Health Department in food analysis and sanitary inspection; the Department of Psychology acts with the Board of Education in the treatment of defective children.

**Collenchyma** (*kŏl-lĕn'kĭ-mȧ*) (in plants), a peculiar kind of tissue in many plants which serves as an elastic mechanical support and is developed immediately beneath the epidermis. It may be recognized in cross-sections by the fact that its cell-walls are thickened at the angles and have a characteristic pearly white luster.

**Col'lingwood,** a town of 7,291, one of the principal seaports on Georgian Bay (Ontario), beautifully located at the foot of the Blue Mountains. Enjoys a large grain trade with Chicago. A lumber center for all the ports on the north shore of Georgian Bay. It is on the Grand Trunk Railway, and the home port of the Northern Navigation Co., the steamers of which ply thence to the numerous lake-ports.

**Col'lins, William,** an English poet, was born at Chichester, Eng., Dec. 25, 1721. While a schoolboy he wrote his *Oriental Eclogues*, the most popular of his poems during his lifetime. After leaving Oxford he sought to make a living as an author in London, but his health and irregular ways of working unfitted him for success in such a life. His place among British poets is due to his *Odes*, which did not meet with the praise they deserved, when they first appeared, and were little valued even by such critics as Dr. Johnson and the poet Gray. In 1753 Collins' reason gave way, and he died on June 12, 1759, utterly unnoticed by a single newspaper of his time. His finest odes are, perhaps, *To Evening* and *The Passions*, though his most popular poems are that on the *Death of the Poet Thomson* and that beginning with "How sleep the brave."

**Col'lins, William Wilkie,** an English novelist, was born in London, Jan. 8, 1824. He had a good schooling, spent four years in business, and studied law. However, he turned to writing, first bringing out a life of his father, who was an eminent painter. His novels took high rank, and he became famous for devising deep and tangled plots for his stories. Hence he was called the Weird Concocter. His best novels are *The Woman in White*, *The New Magdalen*, *No Name*, *Poor Miss Finch*, *Armadale* and *The Moonstone*. He died in London, Sept. 23, 1889.

**Collodion,** a clear, colorless, gummy and highly inflammable liquid prepared by dissolving gun-cotton or pyroxylin in an equal-parts mixture of alcohol and ether. The gun-cotton is prepared from common cotton-wool by first boiling it in a solution of sodium carbonate, washing and drying it and, second, by placing tufts of it for eight or ten minutes in a mixture of nitric acid, water and sulphuric acid, and again washing and drying. Collodion was once extensively used in photography, and for some lines of that art is still used. It is very commonly used in surgery and chiropody, being especially valuable for scratches, chafings and minor cuts, as it keeps out poisonous substances and is not soluble in water. In one of its common commercial forms it is known as New Skin.

**Coll'yer, Robert,** was born at Keighley, England, Dec. 8, 1823. When a boy, he worked in a factory and afterward became a blacksmith. All his spare time was spent in educating himself. In 1850 he emigrated to America, settling in Shoemakertown, Pa., as a blacksmith and Methodist preacher. He afterward became pastor of a Unitarian church in Chicago, and later on of the Church of the Messiah in New York city. His sermons and books, especially his *Lectures to Young Men and Women*, have made him widely known, and the story of the rise of the blacksmith-preacher to a commanding position is familiar to all Americans. A literary society of Cornell University asked Mr. Collyer as a great favor to make them a horseshoe to hang in their hall, saying that Cornell boys could have no better stimulus than a piece of his handiwork always in sight. The preacher complied, and, asking a blacksmith to allow him to use his hammer, soon proved that he had not lost his skill. A picture of the scene has been painted, showing the white-haired old man with a blacksmith's apron tied over his clerical garb, fashioning a horseshoe on the anvil. He died Nov. 30, 1912.

**Cologne** (*kō-lōn'*), the capital of Rhenish Prussia, lies on the left bank of the Rhine. It is built in a half-circle, surrounded by the *Ringstrasse*, a 60-foot-wide boulevard. Its old churches and buildings of the 11th, 12th and 13th centuries, of Gothic, Romanesque and Transition styles of architecture, are of great interest. But its most famous building is the cathedral, one of the finest specimens of Gothic architecture in Europe. Said to date back to the reign of Charlemagne, it was burned in 1248; its rebuilding was begun in about 1270, and was carried on interruptedly till 1509. It was not until 1823 that work on it was recommenced, and the spires were not finished until 1880. Its entire cost was about $10,000,000 Cologne is a fortress of the first rank, detached forts encircling the city at a radius of four miles from the cathedral. It is well-placed for commerce, and many manufactures are carried on, among them the

famous *eau-de-cologne*. The town was founded by the Ubii about 30 B. C. It became a part of the German empire in 870, was a member of the league of the Hansa towns in 1201, and, losing its independence, came under the sway of Prussia in 1801. Population of Cologne (Köln), 516,167.

**Colombia** (*kô-lôm'bê-ă*), a South American republic, in the northwest corner of the continent, formerly including the Isthmus of Panama. It is washed by two oceans, and has 3,000 miles of coast and an area estimated at 500,000 square miles.

*Surface.* In the east are low, wide plains, and in the west three great ranges of the Andes spreading out like the ribs of a fan. The deep gorge through which the Patia River forces its way to the Pacific between steep walls from 10,000 to 12,000 feet in height forms the only break in the western range of the Andes from Darien to Patagonia.

*Drainage.* The rivers chiefly belong to the Atlantic system. The Ica, a feeder of the Amazon, provides quick and easy communication with Brazil. The Meta, an affluent of the Orinoco, affords navigation from near Bogotá to the Atlantic. The Magdalena-Cauca and the Atrato are more important, flowing nearly the length of the land, emptying into the Carribbean, and offering feasible communication to the tablelands.

*Climate and Rainfall.* In a day's journey one may encounter all the climates of the world, from the valleys choked with the rich growth of the tropics to the never-melting snows of the peaks. On the lowlands there are a dry and a rainy season, on the tablelands *two* of each. The rainfall is enormous, short rivers carrying almost continental volumes of water.

*Natural Resources.* Colombia distinctively is a mineral land. It abounds in alum, amber, amethysts, antimony, asphalt, coal, copper, emeralds, gold, iron, lead, limestone, magnesium, mercury, platinum, potash, salt, silver, soda. Spain in three centuries mined $300,000,000 of precious metals. The forests contain the aloe, brazilwood, cinchona, fustic, indigo, logwood, sarsaparilla, tolu balsam. The flora ranges from tropical varieties to alpine or arctic types.

*Agriculture.* On the loftier levels the crops of the temperate zone are cultivated; on the coast the banana, chocolate, cocoa, coffee, cotton pepper, plantains, rice, sugar, tobacco and yams. On the plains cattle and horses are largely bred.

*Manufactures and Commerce.* Beyond basketmaking, dying, tanning and weaving, there are almost *no* manufactures, though distilleries, glassworks, cigar-factories and sulphuric-acid factories have been founded. Other manufactures include candles, iron, "panamas," shoes and soap. Excellent harbors on both coasts create a favorable situation for commerce, but the absence of good roads and railways hampers trade. Honda, the head of steam-navigation on the Magdalena, is connected by rail with Bogotá, and there are other short railroads, but they serve only the most limited areas. The principal exports are cinchona, coffee, cotton, hides, indigo; the minor items balsam, ipecac, ivory-nuts.

*Education.* Public instruction was in 1870 entrusted to the state, the schools reformed, teachers brought from Europe, and, anticipating the rest of South America, primary education made free. Higher education is provided by normal schools, state colleges, technical schools and a national university.

*Races.* The most densely populated part of the country is the high and healthy tableland of the eastern Cordilleras, where stands the capital, Bogotá (population 150,300), 8,694 feet above the sea. Of the natives, the Chibchas were the chief, being in civilization almost equal to the Peruvians. Many other tribes lived among the mountains, and about 200,000 survive. The population is made up of whites, Indian half-breeds, mulattoes and Zamboes (half negro and half Indian).

*History.* Amerigo Vespucci visited the northern coasts in 1499; three years later Columbus tried to found a Spanish colony in Panama; Balboa discovered the Pacific in 1513; and the native empire was overcome by Jimenez de Quesada in 1536. The Spaniards ruled badly, and reduced the Indians to serfdom. In 1819 was formed the Republic of Colombia, including what are now Colombia, Venezuela and Ecuador. The character of the people and the lack of close communication between districts far apart made the state unwieldly, and in 1831 the confederation fell to pieces. What now is Colombia was first called the Republic of New Granada, but took its present name in 1861. Its constitution is modeled after that of the United States. Besides Bogotá, the capital, the other chief towns are Cartagena (population 27,000) and Medellin (60,000). Panama was formerly a part of Colombia, but seceded in Nov., 1903. The secession was caused by the action of Colombia in refusing to ratify a treaty which had been negotiated with the United States for the construction of the Panama Canal, and the refusal was held to be directly opposed to the interests of Panama.

**Colombo** (*ko-lom'bo*), capital of Ceylon, was named by the Portuguese after Christopher Columbus. It has a fine harbor, and within the town are two mission-colleges. Colombo was captured by the British in 1796. It has railway connection with Kandy, 60 miles to the northeast. In 1910

Ceylon had 577 miles of railway open for traffic. Population, 158,228.

**Colón** (*kō-lōn'*) (formerly Aspinwall), a seaport at the Atlantic extremity of the Isthmus of Panama. During the gold-rush to California in 1849 the necessity for a short route between the two oceans finally resulted in railroad connection between Colón and Panama. Colón is the terminus of the Kingston cable. The canal-authorities have laid out regular streets, built a good hospital and in various ways improved the town, which has a population of about 4,500.

**Colonna, Vittoria,** the best-known poetess of Italy, was born in 1490, daughter of the constable (a high officer on the European continent in the middle ages) of Naples, and of a famous Roman family. She was married at 17, having been betrothed when only four years old. She was a close friend of Michael Angelo, and admired by the poet Ariosto. Her poems appeared in 1538. She died at Rome in February, 1547.

**Col'ony,** a name applied to the foreign dependencies of a state. Roman colonies were military settlements, usually towns planted to overawe a conquered country. The Greek colony consisted of a band of emigrants, who, as a rule, because of political troubles sought a new home beyond the seas. According to the story of the Æneid, Rome itself was a colony, in the Greek sense, of Troy. Greek colonists did not go far inland, but fringed the shores of Asia Minor, Sicily, southern Italy and even the Crimea with trade-settlements, many of which, in wealth, were in advance of the cities of Greece proper. Modern colonies began a little before the discovery of the New World in the 15th century. Love of adventure, thirst for gold and the desire to spread religion sent Europeans to the far west and east. A long and bitter struggle between the different states for this new land left some of them, at the end of the 19th century, much shorn of their possessions. Spain lost South and Central America, with Cuba and Porto Rico in the West Indies and the Philippine, Mariana and Caroline groups of islands in the east, though she still has possessions in Africa, with an area of 80,580 square miles and a colonial population close upon 300,000. Portugal has lost Brazil, but has long strips on both coasts of Africa and a few small settlements in India, together with the Madeira, Cape Verd and Azores Islands. Holland has lost Ceylon and the Cape of Good Hope to England, but is still enriched by Java and the Spice Islands, Sumatra, the Celebes, the Moluccas, New Guinea (in part) and Curaçao. The French have fared badly. India and half of North America would, perhaps, be French to-day but for two Englishmen, Clive and Wolfe. Algeria and Cochin-China have been acquired later, as also Tunis, Tonquin and Madagascar. The colonies and dependencies in Asia, Africa, America and Oceania extend to 4,227,826 square miles, with a total population exceeding 56 millions. Italy has the port of Massowah, on the African shore of the Red Sea, together with Italian Somaliland and other African dependencies. Germany has only lately reached out for colonies, but has gained valuable possessions on the east and west coasts of Africa, in China and in New Guinea. The area of Germany's colonies exceeds one million square miles, with a population of 12,686,000.

The most important colonies ever founded were the 13 colonies of England which now are the United States. Though England lost half of the North American continent, her colonies dot the globe; cover much more land than those of all other countries taken together; and through them she rules over an area of 11,400,000 square miles (including the United Kingdom) with a total population of about 410,000,000.

Counting the United States as a British colony, the history of modern colonies is the story of the spread of the Anglo-Saxon race. In North America, Australasia and South Africa this race already is in possession of the only large tracts of uninhabited land where white men can work and thrive. The main British possessions are, in Europe, Gibraltar, Malta, Cyprus; in North America, Canada, Newfoundland, the Bermudas, with various West India islands, Honduras; in South America, Guiana and the Falkland Islands; in Africa, Cape Colony, the Transvaal, the Orange River Colony, Natal, Mauritius, Ascension, St. Helena; in Asia, India, Ceylon, Straits Settlements, North Borneo, Hong-Kong; in Australia and Oceania, Australia, Tasmania, New Zealand, New Guinea (in part) and Fiji.

**Color,** a sensation of the eye produced by light-waves. When a beam of white light is passed through a prism of glass, it is stretched out into a band of light called the prismatic spectrum. One part produces the sensation of red; another part, the sensation of green; another, of blue; and so on These different sensations are called colors. As was proved by Newton, Young and others, each of these different colors is produced by light of a different wave-length, and white light consists merely of light in which all these colors are combined in the proper proportion. Newton showed that colored light may be produced from white light in one of three ways: (1) By refraction in a prism or lens, as seen in the rainbow. (2) By diffraction, as, for instance, in the colors seen in mother-of-pearl and in the blue color of the sky. (3) By absorption, as, for instance, the red color of a brick-house or the green color of grass;

where all the white light which falls upon the house is absorbed except the red, and all which falls upon the grass is absorbed except the green.

The mixture of colors is a very complicated subject, but the student will find it very lucidly treated in Captain Abney's little book: *Color Mixture and Measurement* in the Romance of Science Series; as also in Shelford Bidwell's *Curiosities of Light and Sight.*

**Colorado** is located in the center of that portion of the United States west of the Mississippi River. The state is quadrilateral in shape; and is bounded by Wyoming and Nebraska on the north, Nebraska and Kansas on the east, Oklahoma and New Nexico on the south and Utah on the west.

*Area.* The state is about 370 miles long and 280 miles wide, while the gross area of the state is 103,948 square miles. Deducting a few small lakes and other bodies of water leaves 103,658 square miles of land area. Colorado is larger than Great Britain, half as large as France, and nearly equal in area to New York, Pennsylvania, New Jersey and Delaware combined.

*Mountains.* The continental range of the Rocky Mountains extends across the state from north to south near its center. Pike's Peak, west of Colorado Springs, is the most famous peak in the state, but not the highest, it being one of many that have an elevation of 14,000 feet to 14,500 feet.

The surface of Colorado has two natural divisions,—mountains and plain. The mountain-division has an altitude from 5,000 feet to 14,000 feet. The plain-division is from 4,000 feet to 5,000 feet high.

*Rivers.* The principal rivers of the eastern slope are the South Platte and the Arkansas. The Rio Grande drains the San Luis valley. The Grand flows toward the southwest. The Yampa and White are tributaries of the Green, which unites with the Grand in eastern Utah and forms the Colorado River. None of these rivers is navigable. These rivers with their numerous branches furnish a supply of water for irrigation purposes.

*Climate.* The climate is delightful; the air is dry, the sunshine abundant. There are rains throughout the warm parts of the year and snows in winter, but both are moderate in quantity. The altitude and dryness minimize the heat in summer and the cold in winter. The perpetual-snow line varies between 13,000 and 14,000 feet, except on the side of the mountains sloping to the north and in deep canyons where it is lower.

*Mineral Springs.* There are more than seventy-five groups of mineral spings having medicinal properties. The most noted ones are located at Manitou, Canon City, Idaho Springs, Glenwood Springs, Hot Sulphur Springs, Steamboat Springs, Pagosa Springs, etc.

*Land.* The report of 1911 of the Commissioner of the United States General Land-Office, Washington, D. C., shows that 20,599,100 acres of government land were unappropriated and unreserved, of which 19,069,624 acres had been surveyed and 1,529,476 acres had not been surveyed. Since the date of that report there have been many entries by settlers on such lands. When Colorado was admitted to the Union, Congress granted to the state two sections of land in every township for the support of the public schools.

The soil on the uplands is a rich, sandy loam, varied in some localities by clay or adobe. Along the river-bottoms it is largely alluvial; in some places siliceous and micaceous.

*Agriculture.* The recent development of agriculture through irrigation has been the wonder of western civilization. In 1910 there were 46,170 farms, average value $10,645. The average number of acres per farm was 293, which was more than twice the size of the average farm in the United States. This is due to the number of stock-grazing-farms. Farm-products are cereals, roots, vegetables, fruit, hay-fodder, live stock, wool, dairying, poultry, honey, etc. Colorado excels other states in the average value per acre of farm-crops. Owing to the superior quality of Colorado fruit, it is very extensively shipped to other states.

*Mining.* Colorado leads in the production of the precious and allied metals, producing twice as much gold and silver as any other state and more than one third of the total output of the United States. Colorado possesses inexhaustible coal-deposits, and in 1906 was seventh among the coal-producing states, surpassed by Pennsylvania, Illinois, West Virginia, Ohio, Alabama and Indiana in the order named. It ranked second among the states as a producer of anthracite, being surpassed by Pennsylvania. The Colorado coal-fields are found on both sides of the Rocky Mountains, those on the western slope being the largest and most important in quantity and quality. In the year 1910 the state produced 11,973,736 tons, which were valued at $17,026,934, and employed 15,864 men in and about the mines. Coke is manufactured extensively, and the state has abundant deposits of iron ores.

*Manufacturing.* The great variety of raw materials gives Colorado advantages as a manufacturing state. The leading manufacturing industries are the iron and steel plant at Pueblo, foundries and machine-shops at Denver, smelting of gold, silver, copper, lead and other ores, canning-factories, creameries and cheese-factories, flouring and grist-mills, printing and publishing plants, saw-mills, beet-sugar factories, etc.

*Population.* Colorado's total population in 1900 was 539,700. It is now estimated by latest federal estimate is now 975,190. Eighty-three per cent. are American born and 17 per cent. foreign born. Colorado has only 1.6 per cent. negroes, a less percentage than other states, and a less percentage of Orientals than any of the Pacific states. As to Indians, Colorado has fewer than either New York or Pennsylvania.

*Railroads.* Colorado has better railroad accommodations than any other Rocky Mountain state, only one county, Baca, being without railroad communication. There already are over 5,000 miles of railroad within its boundaries, and more are being constructed. The principal railroads are the Denver and Rio Grande, Colorado and Southern, Union Pacific, Burlington, Atchison, Topeka and Santa Fe, Colorado Midland, the Denver, Northwestern and Pacific and the Missouri Pacific roads.

*Education.* Colorado ranks among the foremost in education. There are more than 2,000 school-buildings, with 5,000 teachers and an attendance of 168,000 pupils. The annual expenditure for school purposes is five and one-half million dollars. The state institutions of higher education are the State University at Boulder, State School of Mines at Golden, State Agricultural College at Fort Collins and the State Normal School at Greeley.

*History.* Colorado was acquired in three tracts: a portion of the north and east by the Louisiana-purchase of 1803; a portion of the west and north by the Mexican cession of 1848; the remainder by a purchase from Texas in 1850. Coronado, in 1541, is supposed to have been the first white man to set foot within the present limits of Colorado. In 1776 Escalante traversed the western and southern portions. The first organized American exploration was made under government authority in 1806 by Lieutenant Zebulon N. Pike. The next expedition was undertaken in 1819 by Major Stephen S. Long. In 1842 John C. Fremont began a series of five explorations in search of practicable rail-routes.

The first important discovery of gold was made in 1858. At this time trappers and scouts were about the only white inhabitants of Colorado, and there were only a few forts, stockade and trading-posts; such a trading-post was established in 1840 on the present site of Pueblo. When the first gold-hunters came to Colorado the parks were inhabited by the Ute Indians; the plains by the Cheyennes, Arapahoes, Kiowas and Comanches. The Indians have since been placed upon reservations.

In 1876 Colorado was admitted into the Union as the Centennial State. The prehistoric remains, consisting of numerous cave-dwellings and ruins found in southern Colorado, have been set apart as a governmental reservation.

**Colorado** (*kŏl'ō-rä'dō*) (meaning red), a river 900 miles long and navigable for 600 miles. It is formed by the junction of the Grand and Green Rivers. Its main branches are the San Juan, Flax, Bill Williams and Rio Gila. It flows southwest through southern Utah and northwestern Arizona; next separates Arizona from Nevada and California; then enters Mexico and empties into the northern end of the Gulf of California. The Colorado itself and most of its branches flow at the bottom of deep cañons, slowly cut out by water during the lapse of eons. Below the mouth of the Flax, for nearly 400 miles, the cañon walls rise from 4,000 to 7,000 feet, forming the Grand Cañon of the Colorado, one of the great wonders of the world. In 1906 the river created Salton Sea in southern California.

**Colorado River** of Texas is over 900 miles long, and averages 250 feet in width. In winter steamboats go up the river as far as Austin. Throughout most of its length it flows through a region of rich soil, and is a beautiful, clear stream. It empties into the Gulf of Mexico, at Matagorda Bay.

**Colorado Springs,** county seat of El Paso County, is an attractive city, 75 miles south of Denver. Its altitude is 6,000 feet, and it is situated on a plain near Pike's Peak, and is known the world over as a health and pleasure resort. The city possesses a handsome opera-house, five clubs, several fine school-buildings, the State Blind and Mute School, sanitariums, hospitals and fine churches. It was settled in 1870: but the Cripple Creek gold discovery in 1891 nearly doubled its population. Colorado Springs is served by six railroads, and has all the adjuncts of a modern city. Population, 31,717.

**Colosseum** (*kŏl"ŏs-sē'ŭm*), the largest of the Roman amphitheatres. Amphitheatres were oval-shaped buildings, used by the Romans for combats of gladiators and for wild beast fights. In the theatre, where plays were performed, the seats faced the stage in a half-circle; in the amphitheatre the seats entirely surrounded the place of performance; hence the name, from *amphi*, meaning all around. The Colosseum, besides being the largest of these buildings, is the best preserved, and is one of the most interesting ruins in the world. It was begun by Vespasian, and finished by Titus in 80 A. D. It covers about five acres of ground, and was able to seat 87,000 persons. It is 612 feet in length, and 515 feet wide. When Titus dedicated it, 5,000 wild beasts were slain and the games lasted for a hundred days. On the outside it is 160 feet high, built in three rows of columns and surrounded by a row of pilasters. Between the columns are arches, forming open

galleries running throughout the entire building. On the inside the open space in the center was covered with sand or sawdust, while the games were going on, and so was called the *arena*, from the Latin word for sand. Around the arena was a gallery where sat the emperor, senators and vestal virgins. Above were three other tiers of seats, corresponding with the three rows of columns on the outside. The Colosseum in the middle ages gave rise to the saying: "While stands the Colosseum Rome shall stand; while Rome shall stand, the world."

**Colossus** (*kŏ-lŏs'sŭs*) **of Rhodes,** a huge statue of Helios (the sun), the chief god of the Rhodians. It is said to have been the work of Chares of Lindus, who spent 12 years on it, finishing it in 280 B. C. It was called one of the seven wonders of the world, though not a masterpiece of sculpture. Its height was from 90 to 120 feet. It stood near the harbor; but the story that it was placed astride the entrance is erroneous. In 224 B. C. it was overthrown by an earthquake, and lay an object of wonder until 653, when it was sold to a Jew for old metal.

**Colt, Samuel.** See REVOLVER.

**Columbia.** See DISTRICT OF COLUMBIA.

**Colum'bia** or **Oregon River** is 1,400 miles long. Next to the Yukon, it is the largest river on the American Pacific coast. It rises in the Rockies of British Columbia, flows through Washington, separates that state from Oregon, and empties into the Pacific. Its mouth forms an inlet from three to seven miles wide and 35 miles in length. Its main branches are Snake River and Clarke's Fork. There are many falls and rapids, so that, though it is navigable for some 660 miles, freight has to be carried by railroads past the various breaks of the river. The salmon-fisheries are noted.

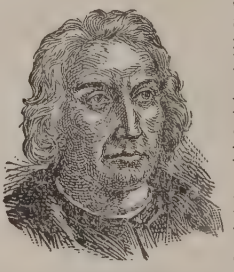
**Columbia, Pa.,** a borough in Lancaster County, on the left bank of the Susquehanna River, 80 miles by rail west of Philadelphia. A railroad-bridge across the river connects the town with Wrightsville. The town was founded in 1726 by English Quakers. Its factories include rolling-mills, flouring-mills, foundries, tanneries, silk, lace and pipe mills, wagon, brush, stove, novelty, embroidery and shirt-works. It also has manufactories of railroad-iron. It has an active civic life, good schools and a public library. Population, 11,454.

**Columbia,** the capital of South Carolina, is situated on the left bank of the Congaree River. The town is beautifully laid out with broad and well-shaded streets, all of which cross at right angles. Having been the capital of the state since 1790, it has many imposing public buildings, including the state-house, penitentiary, hospital for the insane, etc. Several well-known colleges and quite a number of fine cotton-mills are located in the city. When the city was evacuated by the Confederates at the approach of Gen. Sherman in the spring of 1865, large quantities of cotton piled in the streets caught or were set on fire, and all the business section and many private residences were consumed. The population in 1900 was 21,108; to-day it is 33,506.

**Columbia University,** located in New York city, was chartered in 1754 as King's College. During the Revolutionary War the work of the college was suspended, and the building was used as a hospital. College work was resumed in 1784, and the name of the institution changed to Columbia College. Under this name the college has had a long and prosperous career. The law department was established in 1858; the medical department in 1860; the school of mines in 1863; the school of political science in 1880; the school of philosophy in 1890; and the school of pure science in 1892. Barnard College for women, founded in 1889, became affiliated in 1890. In 1896 the name of the institution was changed to Columbia University. It is now an amply equipped and richly endowed institution. It has a library of 550,000 volumes, 888 officers of instruction and 7,322 students, exclusive of summer-school and extension students.

**Columbine** (*kŏl'ŭm-bīn*), a well-known and popular wild flower, which is widely diffused, and which has been suggested as the national flower of the United States. The leaflet is three-lobed and the flower, which passes from yellow to red, has five petals with long spurs, giving it a striking resemblance to the liberty-cap.

**Columbus, Christopher.** In 1470 there arrived on the coast of Portugal, on a plank that was part of the wreckage of a privateer sunk in a sea-fight, an adventurous mariner. Born in Genoa, Italy, perhaps in 1436, perhaps in 1446, he was of the stature and coloring of Norse pirates. His eyes were as pale a blue as sea-ice, his red and white skin was bronzed by 20 years' exposure to wind and sun; his auburn hair, already pointed with silver, shone like a nimbus above a handsome, smooth-shaven, aquiline face. Besides being a skilled navigator, he was a man of learning, temperate habits and speech and as strict piety as if he were of some religious order. These qualities must have recommended him in Lisbon, for the Portuguese were among the most ardent Christians and the most daring voyagers in the world. Grad-



CHRISTOPHER COLUMBUS

ually the facts came out that Columbus, Colombo or Colon (for he used the Latin, Portuguese and Spanish forms of his name indifferently) had learned geography, mathematics and nautical astronomy, and had coasted the Mediterranean and voyaged to the Guinea coast. He had read Marco Polo and Sir John Mandeville, and knew of the strange, disquieting adventures of Portuguese voyagers who had been blown far to the westward. He boldly held the not original opinion that the earth is a sphere.

Although unknown and penniless, this man was so remarkable that within a year he had married the daughter of Palestrello, an ex-governor of the Madeira Islands and a learned geographer. He thus had access to the dead man's maps, charts and calculations that confirmed his opinion that the Indies and the land of Kubla Khan could be reached by sailing westward. He presented a plan for an expedition, first (about 1475) to Genoa, then to John II of Portugal, to Henry VII of England, to two Spanish dukes and finally to Ferdinand and Isabella of Castile.

Twelve years he spent, a beggar at indifferent courts, dismissed as impracticable by the wise, ridiculed by the foolish, betrayed by cupidity, deluded by false promises. His wife died, his property was exhausted, he had been made the buffet of capricious fortune. But he was not dismayed. When learning, piety, self-control and a single-hearted purpose go hand in hand, they may defy all the fates to baffle them. At 55 [?45?] years of age we find him (1492) leading his motherless son, Diego, through the lovely landscape of Andalusia, begging bread and shelter of the monks of La Rabida, a monastery that overlooks the harbor of Palos. Undiscouraged, he poured the tale of his incredible ambition into the ears of the simple brothers, only to find among them a geographer who could understand his plans and an ex-confessor to Queen Isabella who could recommend him to royalty. On the 3d of August, 1492, the monks of La Rabida bade him Godspeed out of the harbor of Palos, on the most momentous voyage in history.

How perilous that voyage was you must read a long biography to realize. It lasted ten weeks. The crews of 120 men were mostly made up of criminals and vagabonds, who had choice of this dangerous adventure or of imprisonment for their misdeeds—as treacherous a lot of cutthroats as ever commander shipped.

The Island of Guanahani was sighted on the 12th of October, 1492, and the banner of Spain unfurled above the soil of the New World. The details of this and of his three subsequent voyages are given in every school-history. The great discoverer had the misfortune—for Spain—to sail too far south. Had he cleared the Bahamas, he must have reached the Carolina coast and discovered the continent of North America. But he struck the wilderness of islands, large and small, that guard the Gulf and the Caribbean Sea, and thus won tropical America for Spain and Portugal, leaving the more valuable northern continent for England and France to colonize and fight over. He thought the earth-sphere much smaller than it is and Asia much larger, and mistook the archipelago of the West Indies for islands fringing India, China and Japan. So he continued to explore these, seeking always the continent beyond. On his fourth and last voyage he skirted South America, found the Orinoco River, and reached Yucatan. The sweep of the Gulf Stream made him look for a passage westward about where we are digging the Panama Canal to-day. On his first voyage he built a fort on San Domingo, now Haiti, out of the wreckage of the Santa Maria, and planted a colony. Then he returned to Spain with gold, strange plants and animals and six natives for baptism. After his second voyage, in 1493, misfortune, misery and insults marked the remaining ten years of life, lightened by brief periods of wealth, honor and royal favor. In the failure of his colonies too little allowance was made in his own time for the evils of a tropical climate, savage natives and uncultivated land. Too little is made by his biographers of the character of Spanish colonists. The adventurers who went with Columbus were inspired, not by desire for a home in the New World, but by greed for gain and by religious bigotry that had its logical result in exploitation and cruelty. His long absences from Spain gave ambitious and unscrupulous men at court ample time to plot, so that adequate support and authority were withheld from him. From his third voyage (1498) he was sent home (1500) in irons and, as he feared, to disgrace and death. Tardy reparation made and his enemies punished, he had the magnanimity to set out on a fourth voyage in May, 1502, for their majesties of Spain. In May, 1506, he died at Valladolid, Spain, aged 60 or 70. In 1796 his bones were removed from San Domingo to the cathedral at Havana, Cuba. The title Duke of Veragua was conferred on his son Diego, and continues to-day in the descendants of his great-granddaughter.

Columbus' task was to conceive a benificent idea and to put it to the proof in the most obvious way. For this his knowledge was as complete as possible, his plan definite, his purpose undefiled by self-interest, his resourcefulness and persistence unbounded, his courage sublime. He found a path across the unknown seas, and charted it so others could safely follow. He had

sown the seed, leaving to others the harvest. Even the continent he had discovered was given the name of a later, lesser man. But for that he probably would have cared little. His personal name Christopher, he shrouded in a mystical, pietistic signature which symbolized the fact that he considered himself but a servant of Christ, Mary and Joseph. Above his title which made the descendants of a Genoese woolcomber grandees of Spain, he held his rank of admiral. He was the greatest mariner the world had seen, or was to see, undespairing, undismayed. By his will he directed that the head of his house, in every generation should describe himself as Duke of Veragua, *The Admiral*. The best known and most accessible life of Columbus is probably the one by Washington Irving. It needs to be supplemented by the writings of Adams, Fiske, Harrisse, Markham, Prescott, Thacher or Winsor.

**Colum'bus, Georgia,** a railroad center at the head of navigation on Chattahoochee River. It has wonderful waterpower, aggregating 136,000 horsepower at and above the city, 27,000 of which is already developed and in use. It is a large manufacturing center, having 16 cotton-factories, 6 large fertilizer factories, two large iron-mills, two flour-mills, clothing-factories, the largest show-case factory south of the Potomac and a variety of industrial establishments, including cotton compresses, woolen mills and wood-working plants. There are also many large factories just beyond the city limits. It has an excellent school-system, providing for all children from kindergarten to college. The latest addition to its school-system is the secondary industrial school which is an academic trade-school of high-school rank. According to the census of 1900, the population was 17,614. It has had a steady growth of recent years, and its population by latest census is placed at 21,805.

**Columbus, Ind.,** a city and county-seat of Bartholomew County, situated on a branch of White River. It has flour and starch-mills, and manufactures agricultural implements, furniture and cerealine. It has the service of the Big Four and Pittsburg, Cincinnati, Chicago & St. Louis railroads. Population, 8,813.

**Columbus,** the capital of Ohio, is situated on the Scioto River, a little south of the center of the state. It is a city of broad streets and large parks. The fine capitol and the United States and board-of-trade buildings are among its main structures. It contains an insane hospital, state penitentiary and asylums for the blind and deaf and dumb. There are 38 public-school buildings, four of them high-schools, and they have more than 20,000 pupils. Among the higher institutions are Capital City University, Ohio State University and St. Mary's Academy. Besides, there are three medical colleges, a dental college and five public hospitals. There are several parks and 40 or more churches. Natural gas is used for domestic purposes, and there is an unlimited supply of bituminous coal near the city. Columbus is an important manufacturing city, possessing steel-plants, blast-furnaces and malleable-iron works, and making cash-registers, agricultural implements, automobiles, all varieties of vehicles and shoes, gloves and clothing. Its public buildings in number and cost are not excelled by any city of the country, except Washington. Columbus was laid out in 1812 and incorporated in 1834. It has been the state capital since 1816. Eighteen railroads and its nearness to the Ohio coal-and iron-fields have done much to increase the growth of the place Population, 181,511.

**Columel'la** (in plants), an axis of sterile tissue which passes through the center of the spore-case of mosses. See MUSCI.

**Coman'ches** (*kō-măn'chĕz*), a tribe of Indians of the Shoshone family. They do not live in villages, but, carrying their skin-lodges with them, roam over the country. When first found by the French in 1719, they hunted from the head-waters of the Brazos and Colorado to those of the Arkansas and Missouri. They are great hunters, riders and fighters, and are divided into eight bands. They had long and bloody wars with the Spaniards, were at one time on a reservation in Texas, and later some of them were in the Indian Territory. They have medicine-men, and worship as their god Niatpol (meaning "my father"). Years ago, they numbered 10,000 or 12,000, filling up their ranks with Mexican captives. They now number some 1,500, and are chiefly settled now in Oklahoma.

**Com'edy.** See DRAMA.

**Com'ets,** the name given to those large and more or less bright bodies which now and then enter the solar system, sweep around the sun, and again return to more distant regions of space where they become invisible as before. In general comets are composed of three parts. First, there is a luminous cloud, the *coma*, from which these bodies take their name. In its center is generally found a brighter *nucleus*, the part which the astronomer observes when he determines the orbit of the comet. Thirdly, there is the *tail*, which is a great streamer of light, following the comet as it approaches the sun and preceding the comet as it leaves the sun. Considered with respect to their brightness, comets may be divided into two classes: *telescopic* comets and *naked-eye* comets. By far the greater number belong to the first class and can be seen only by the aid of a telescope. Considered with reference to their orbits, comets may be divided into three

classes: (1) those whose orbits are elliptical; (2) those having parabolic orbits; and (3) those having hyperbolic orbits.

Nearly all comets appear to move along a parabola, having the sun at the focus; some 20 per cent., however, of those studied move in elliptical paths. Since a parabola is a curve which has two branches extending off to infinity, we do not expect ever to see again a comet which has a parabolic orbit. But an ellipse is a closed curve, and accordingly some of those comets having elliptical orbits have been observed many times.

NATURE OF COMETS

Concerning the composition or structure of comets very little is known, and that little has been learned almost entirely from the spectroscope. This instrument shows that a very small portion of the comet's light is reflected sunlight. The comet shines by its own light, giving a spectrum which is described as follows by Professor Young of Princeton:

"The spectrum of most comets consists of a more or less faint continuous spectrum (which may be due to reflected sunlight, though it usually is too faint to show the Fraunhofer lines) overlaid by three bright bands,—one in the yellow, one in the green and the third in the blue. A fourth band is sometimes visible in the violet. The green band, which is much the brightest of the three, is in some cases crossed by a number of fine, bright lines, and there are traces of similar lines in the yellow and blue bands. This spectrum is absolutely identical with that given by the blue blaze of an ordinary gas or candle flame; or, better, by the blue flame of a Bunsen burner consuming ordinary illuminating gas. Almost beyond question it indicates the presence in the comet of some gaseous hydrocarbon, which in some way is made to shine; either by a general heating of the whole body to the point of luminosity (which is hardly probable), or by electric discharges within it, or by local heatings due to the action of sunlight; or none of these surmises may be correct, and we may have to seek some other explanation not yet suggested.

It therefore, on the whole, appears highly probable that comets are bodies made up of small discrete particles.

One great mystery in connection with these bodies is the fact that the tail is repelled by the sun. But recently the Swedish physicist, Arrhenius, has given an explanation of this fact, which is quite plausible. He bases his explanation upon the fact, discovered by Maxwell, that a beam of light exerts a pressure in the direction in which the light is traveling and that the amount of this pressure is numerically equal to the amount of energy, in unit volume, of the beam of light. If, now, the particles of which the comet is composed are very small, they will present a surface which is very large compared with their mass. Since this pressure increases very rapidly as the comet approaches the sun, it is an easy matter to compute, for particles of any given size, just how near the sun they must go in order that this repulsive pressure due to sunlight may equal the gravitational attraction of the sun for the particle. If the comet should come nearer the sun than this limiting distance, repulsion will ensue. Or at any given distance we can easily compute the size which the particles must not exceed in order to be repelled by the sunlight. This explanation is quite is accordance with the results obtained by means of the spectroscope.

REMARKABLE COMETS

In recent times the most brilliant comets are those of 1858 and 1882. The former is known from its discoverer as Donati's. To the astronomer no comet has more interest, perhaps, than that of Halley (1682), whose return to the solar system in 1759 was predicted by its discoverer. The comet actually returned, as predicted, and in 1835 returned for a second time. Its next return occurred in 1910. Encke's comet is also one of great interest, returning every three and one-half years. See Miss Clerke's *History of Astronomy during the 19th Century*, Chaps. 5, 10 and 11.

**Commerce.** The idea of commerce is a part of the idea of property, and property implies that a thing has value to oneself and also to others. In commerce there is an exchange of property, in which each party gains what he desires. But commerce is no longer the mere *barter* of savages. It is a vast system in which all the world shares. It helps to make prices and wages more equal. It also keeps them more fixed, for, if one group will not pay a fair price, the goods may be sent elsewhere. It gives a very wide market, so that a country may now produce more butter or meat than it needs, and yet sell all of it by sending the surplus abroad. It brings people all over the world into greater sympathy with each other, and gives them more knowledge of each other. Thus a failure in the cotton-crop of the southern states has been the cause of almost a famine in Lancaster, England, where much of the cotton is made into cloth. Commerce is favored by a large coast-line and good ports; for it is cheaper to carry goods by water than by land. It depends partly upon soil and climate and the presence of iron and coal in a country; partly, too, upon the cheapness of labor; but more largely upon freedom and security, industry and ease of communication.

So far as is known, the Arabs were the first great overland traders. The Phœni-

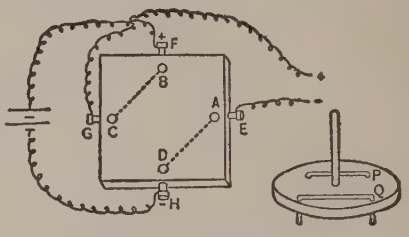
cians, however, a nation of traders whose home was on the strip of coast that lies about Tyre and Sidon, were the first merchants to plan and execute great voyages by sea for the sake of trade. Their ships roved even to the Atlantic and the distant shores of Britain. The Greeks also were great traders; and Carthage, a Phœnician colony, became so powerful and wealthy through her commerce that it required all the might of Rome to humble her in the dust. In the middle ages the great trade between Asia and western Europe lay chiefly in the hands of the merchant republics of Venice and Genoa. But so soon as the route round the Cape of Good Hope to India was found and the new continent of America also came to attract the eye of the European trader, commerce centered in the nations of the Atlantic rather than of the Mediterranean. At first Spain and Portugal, and afterwards England and Holland became the great world-traders. In the latter part of the long strife of England and France for colonial empire the United States, having won their independence, became the great neutral carriers of merchandise.

The extent to which commerce grew in the nineteenth century is almost beyond belief. It was favored greatly by the invention of the telegraph, the success of ocean-cables (q.v.) the building of railroads and the invention of steamships. It was only in 1819 that the first steam-vessel crossed the Atlantic Ocean. In England in 1800 the imports were valued at under $29,000,000; in 1900 at over $523,000,000; while the exports in 1800 were valued at under $35,000,000; and in 1900 at over $354,000,000. Or take the commerce of the United States in the second half of the nineteenth century. Whereas in 1850 the exports and imports together amounted to $318,000,000; in 1900 they amounted to no less than $2,244,000,000 in estimated values, while in 1907 they amounted to $3,315,272,503.

**Commons, House of** (English). See PARLIAMENT.

**Com'mune of Paris** (*kŏm'mūn*). Commune is the unit or lowest political division of France, corresponding to the American township. The rising of the Commune of Paris, in 1871, should not be confounded with communism, with which it had nothing to do. It was a revolutionary attempt to establish self-government for Paris. The theory of the rising was that every commune should have self-government and that the state or central government should be merely a federation of communes. The movement was caused by discontent in Paris, where the people found themselves in possession of arms after the siege by the Germans. The rising occurred on March 18, 1871, and was put down only after 10 weeks' long and bloody fighting between the forces of the commune and a large army of the central government. Sixty-five thousand communists fell during the last ten days in May.

**Com'mutator.** In most kinds of electrical work it is necessary at times to change the direction of the current in some part of the circuit. The commutator is an instrument for producing this change. The device represented in the accompanying figure is typical of all commutators. The block A, B, C, D is made of wood, and has four holes bored about half-way through it. These holes, placed one at each corner of a square, act as cups to hold mercury.




A TYPICAL COMMUTATOR

Into the sides of the block are inserted four wires, E, F, G, H. Each of these wires connects with the mercury in the cup nearest it. The poles of the battery are joined to two diametrically opposite cups, say B and D; the wires from the rest of the circuit, say from a galvanometer, are joined to the remaining two cups, A and C. For closing the circuit two short, thick, copper conductors P and Q, are mounted on a movable block, as shown in the figure. These connectors, P and Q, may be placed in the mercury cups in such a way as to connect B with A, and hence C with D; or they may be placed so as to connect B with C, and hence A with D. In the one case the current flows from G to E through the galvanometer; in the other case from E to G. To change the direction of the current in the galvanometer circuit, we have, therefore, only to lift the top block and rotate it through 90° in either direction. Such an instrument is called a commutator.

In many kinds of electrical machinery the commutator is made to work automatically. Thus, in the case of the dynamo, the currents which are generated in the coils of the armature are alternating, but a commutator is in many instances placed on the shaft of the armature, which automatically reverses the connections of the armature-coil and the external circuit, so that the current in the external circuit always flows in one direction. Such a dynamo is called a direct-current generator. The dynamo which is not provided with a commutator is called an alternate-current generator.

**Como** (*kō′mō*), **Lake,** is situated in northern Italy, at the foot of the Alps. It is 30 miles long, and its greatest width is two and one half miles. The fine climate and the beauty of the scenery of its shores have made it the most popular resort of any lake in Italy and its shores are lined with handsome villas.

**Comoro** (*kŏm′ō′rō*) **Islands** or **Comores,** lie in the Mozambique Channel. They have been French since 1886, and are administered by the governor of Réunion Island, who appoints a resident for Great Comoro and another for Moheli and Anjuan, which with a number of islets make up the group. The total area is about 620 square miles, with a population of 47,000, nearly all Moslem. Each island has its own budget, and all are self-supporting, sugar and vanilla being successfully grown and coffee and cloves under development. An important coaling station is situated here.

**Comox.** The northern part of Vancouver Island (British Columbia). A part of the opposite mainland is called Comox district. The two contain 4,000,000 acres. The district is very rich in minerals and timber. Considerable fertile land is found between Comox Bay and Campbell River. The Esquimault and Nanaimo Railway will go through the district. Along the deeply indented coast-line the fishing industry is being developed on a large scale. The whole district is very rich in fertile belts, minerals and timber.

**Compass** (*kŭm′pas*), **Magnetic,** an instrument for indicating the direction of the magnetic meridian. The importance of this determination lies in the fact that, if we know any one fixed direction, such as this magnetic meridian, it is easy to locate any other direction by the use of a graduated circle. In this way the direction of a line-fence or the course of a vessel may be easily described.

The three parts of a mariner's compass are (1) a freely suspended steel magnet; (2)

a card attached to the magnet and moving freely with it; and (3) a compass-box, in which the needle and card are so mounted as always to remain level, however the box may be tilted.

The free suspension of the needle is generally obtained by attaching to it a cap of agate or ruby, which rests on a hard, sharp point.

Practically all the compasses now used on ocean-going vessels are of the type devised and patented by Lord Kelvin in 1876. The magnet is built up of eight or ten small magnets placed some distance apart but parallel to each other. Since the greater part of the mass is thus placed at considerable distance from the axis of rotation, the Kelvin needle is very steady.

For many centuries—at least since the time of Chaucer (1391)—the compass-card has been divided into 32 equal angles called points. Each point is evidently equal to $11\frac{1}{4}°$. The names of these points are indicated in the accompanying figure.

In the surveyor's compass the needle swings freely over a circle divided into degrees and provided with a pair of sights. When these sights are so placed that the line joining them lies in any desired direction, the end of the compass-needle indicates at once the angle which this desired direction makes with the magnetic meridian.

The origin of the compass is lost in obscurity. About 1200 A. D. it was commonly used on the Syrian coast, and it is said that Marco Polo in 1260 brought the knowledge of this Chinese invention to Europe. Gioja of Amalfi, Italy, improved the instrument about 1320. Its variation was known long before Columbus noticed it.

**Compass-Plants.** The ordinary position of a leaf is approximately horizontal. In regions of intense sunlight and dry air, however, certain plants have learned to turn their leaves edgewise. This is called the profile position, and by means of it one edge of the leaf is turned upward toward the most intense light, and thus the leaf avoids too great drying out. The flat surfaces of the leaves thus face the morning and evening rays of light, which are rays of less intensity than those of midday. As a consequence, the leaves point either north or south, and hence such plants were called compass-plants. The rosin-weeds (*Silphium*) of the prairies and the common prickly lettuce (*Lactuca Scariola*) of waste grounds everywhere are among the most notable of the compass-plants. The profile habit is common in the dry regions of Australia, giving to their vegetation a very peculiar appearance.

**Compos′itæ,** the greatest family among seed-plants in point of numbers and in rank. They form one tenth to one seventh of the seed-plant vegetation of almost all regions. Among them are the asters, goldenrods, rosin-weeds, sunflowers, chrysanthemums,

thistles, daisies, ragweeds, sage-brush, lettuce, dandelion and others. They are characterized by the fact that their numerous small flowers are closely packed together in heads which resemble flowers. The sunflower, for example, is a head of very many small flowers, the head being surrounded by a set of bracts known as the involucre, which resembles a calyx. The outermost flowers develop showy petals, and thus resemble the petals of an ordinary flower. Another peculiarity of the family is the transformation of the calyx into the so-called pappus, which commonly, as in the thistle and dandelion, takes the form of a tuft of fine hairs for transporting the seed-like fruit (*akene*).

**Composition in Fine Art.** In the essay upon the fine arts it is shown that the essential quality in a work of art is the power of bringing about a certain repose in the mind of the person who is contemplating the work. Hugo Münsterberg observes this in defining the mission of art instruction: "To bring into every life the ideal repose, the repose in the ideal; to bring us that rest which is not fatigue from work, nor the rush of amusement; no, rather that rest which is complete satisfaction beyond the struggles of the day, complete harmonization of all our energies, complete fulfillment of our real personality."

A work of art, in order to give this complete repose, must have but one theme; it must be free within itself from conflicting attractions or suggestions; it must, in other words, have *unity*. Whether it be a sonnet, sonata, picture, vase or cathedral, it must give one impression. That impression may be simple, as is that given by the architecture of the California missions: it may be complex, as is that of St. Mark's cathedral in Venice; but it must be *one*. It may be grand, as in the sculptures of Michelangelo, or it may be delicate, as in the carvings of the Japanese, but it must be an *unconfused* impression. It may be brought about by combining many similar forms, colors, lines or suggestions until they add power to one another, as in some of the poems of Joaquin Miller — giving that quality which we call harmony; it may be brought about by leading the attention to an unlikeness in certain related things, as in Keats's sonnet *The Grasshopper and the Cricket*, producing a contrast; but in either case a single impression must result.

Now, it will be clear that nature does not always exist in perfect harmonies or perfect contrasts. Nature indeed has other business in hand than the forming of perfect pictures. If he would produce pictorial beauty, the artist must make many a change in the "landscape with figures amid which we dwell." Let us review some of the demands upon him in this respect.

When, in looking over the fields, we send our glance from the trees to the hills beyond them; when we remove our eyes from a person to whom we are speaking, to the walls just behind him; when, in fact, we leave off looking at any one thing and look at something either farther away or nearer than that at which we were looking before, our eyes change their focus for the occasion in somewhat the way in which the focus of a camera is changed to suit varying distances. The eye, however, is by far the more subtle instrument, and is sensitive to variations of distance which would make no apparent difference to the camera. It may therefore be said that each thing we see in nature is, when it is being seen, the center of a little picture all its own and that it is the sum of a number of these little pictures which gives us our impression of "all outdoors." Now, if the artist were to try to paint in one picture the hills as he sees them when looking directly at them, the trees as he sees them when looking directly at them, the clouds as he sees them when looking directly at them, he would have a picture with as many separate interests as it contained objects — a picture which could never have unity or give repose of any sort. So the artist must select some one thing for the main theme of his picture, and to this he must subordinate all other things which may occur in it.

A study of great paintings and illustrations will show the various ways in which artists accomplish this suppression of the secondary things and emphasis of the important ones. It will show that a figure may be made prominent by the position it occupies on the canvas, by its relations to other figures, by its having a space of comparative quiet around it (notice the effect of the halos around the heads in the old-master paintings of the saints), by the focusing of many important lines upon it or the introduction of a contrast near it, by its being more minutely drawn and finished than the rest of the picture, and by the suppression of other figures or groups of figures through partially hiding them from view, turning them away from the spectator, causing them to look or point toward the principal figure or throwing them into a subdued tone.

In nature it is sufficient if the form of a tree be beautiful against the sky; in a picture the visible shapes of sky seen through the tree must be equally beautiful. The picture, since it is all to be seen at once, must be a beautiful pattern in which every shape involved is fine, the background spots not in any sense being left-overs from the shaping of the motif-parts; rather, being conceived in the same æsthetic spirit which characterizes those parts. The contours which distinguish tone from tone may

DANCE OF THE NYMPHS—*Corot*

THE FIGHTING TÉMÉRAIRE—*Turner*

not fall merely anywhere, but only in such ways that tone and tone and interest and interest shall be fairly held at pleasing intervals. Consistency of character, which has been called harmony, consistency of attractions, which has been called balance, and consistency of movement, which has been called rhythm shall keep all elements of the work together in an integral whole. Here again the artist in forming his work must exercise his æsthetic judgment, varying from nature's appearances, if need be, to bring finer proportion into his work, to give it more perfect unity.

The beauty of a picture or a piece of music does not lie in a pleasing of the sense alone. Perhaps it is impossible for the sense to be engaged at all without the mind receiving some deeper message through it. It is this fact which causes us to observe in another place that art is a sort of language. But the message which that language has to deliver is not an intellectual one. It is not primarily for the rehearsing of facts that art exists. The message which a picture has to give, like the message which music has to give, comes to us in the form of an experience, a mood which the work awakens within us—not a story which the thing can tell us. A Bokhara rug may be of "sleepy coloring" and give us the repose of twilight as we contemplate it; a clear melody may give us the same feelings as a view from a mountain-top; a dash of thrilling color may be to us like a battle-hymn. Such are the messages we may receive from pictures and music if we but will, instead of the story that "here is a man and he is doing so and so." These are the feelings which come to us straight from the heart of the artist himself, even though he be centuries in his grave; the tree, the figure and the incident which the work involves are merely the words by which the message is conveyed.

For some reason music in a minor key is apt to make us sigh. For some like reason certain kinds of lines or movements in a picture give us certain emotions. Perhaps it is because these lines or movements recall associations which stamped themselves upon the impressionable childhood of the race. The ridges of the sea which we call waves and the grander ridges of the continents which we call mountains have had their common origin in the war or play of the elements—in activity rather than in quiet. The risings and fallings of the waves and the mountain-ranges, the high, straight stems of those still forests amid which generations of our primitive ancestors spent the long days and the mysterious nights, the long flat reaches of the sea when it is calm and of the desert and of the clouds in a quiet sky—all these things have been seen and watched for ages; nor is it to be wondered that the lines which we see in them, the movements which we feel in them, have come to call up the same feelings which these things themselves called up.

Let us look at Corot's landscape *Morning*. It has come to be called *The Dance of the Nymphs*. Is this because there is a group of tiny figures at the bottom—who in truth are scarcely dancing and who may hardly be called nymphs? Or is it because of the witchery of that great movement which takes us from the bottom up into the picture, across the top and down the other side, lastly circling round and round the bit of sky in the center, leading us, before we know it, in an airy dance through the tree-tops? The little figures give the key-note—they form a statement of the theme, Morning, Happiness, Dancing, but even if they were suddenly to whisk themselves out and disappear on the other side of the tangled shrubbery, the movement of the picture would still go on, and it would still be a dance of the nymphs.

For a contrasting mood see Turner's great picture, *The Fighting Temeraire*. What is there about this picture to show us that this ship is the old hero of England's battles that she is,—or to tell us that she is being towed away for breaking up? And yet Ruskin says that, of all pictures not visibly involving human pain, this is the saddest. What has the artist done to make us feel the solemnity of this occasion? We see a sheet of still water under a great, bending, sunset sky. On the other side a tall ship is coming up, towed by a black tugboat. Long ripples are thrown to left and right, and thin smoke pours back from the funnel of the tug. Shadows are gathering from all sides, and there are the buildings of a great city beyond in the gloom. Study the use of lines. Are they like those merry ones that circle round the canvas of Corot's *Morning*? Or are they the lines which we see in the solemn groves of pine or cypress, in the desert and in the great cathedrals? Are they not like figures in a funeral march? Has the artist accepted nature only as he found her?

We have shown the three principal considerations which compel an artist always to turn away more or less from the copying of nature. Of all these, doubtless the last one which we have touched is the deepest, the one determining the trend of the whole work,—the consideration of *expression*. Intimately related to that one is the second—the consideration of *absolute beauty*; and the third is that one which deals with the *translation of the three-dimensional aspect of nature into the two-dimensional limits of a picture*. We have spoken of the lines and colors and objects of nature as the artist's alphabet and vocabulary. Were he to devote his time merely to copying the things which nature sets before him, he

would be practicing only the handwriting of his art. The considerations which we have enumerated above give him a grammar and a composition—the power to express himself—the power of being understood.

The process of selecting, arranging, subduing and accenting the forms, tones, colors, movements and interests of his work, so that they will produce the mood or set forth the idea which he is endeavoring to present, so that they will give unity and through it the "perfect repose"—this the artist calls composition.

GEORGE WILLIAM EGGERS.

**Compressed Air.** The first scientific knowledge of the power of air was gained in the sixteenth century by Galileo. Air under pressure increases in density and heat, and exerts an increased power in every direction. Hence compressed air is applied in locomotives; and its power is employed in many machine-plants, such as those of mines and water-works. An air-compressor or air-pump is a cylinder fitted with a piston and rod, and with valves at which the free air may enter and with others at which the compressed air may be applied, together with the needful connections of this apparatus with the driving power. In most compressed air "plants," the pressure which is employed is about 80 pounds to the square inch. Air may be liquified at a temperature of 312° below zero. This temperature may be got under a pressure of 1,200 pounds or upwards to the square inch; but the process is thus far not profitable from a commercial standpoint, although there are several ways in which liquid air may be applied.

**Compromise of 1850,** a measure designed by Henry Clay and, largely through his efforts, adopted by both houses of Congress in August, 1850. Its chief purpose was to satisfy the conflicting demands of the north and the south in the matter of slave and free territory. The leaders for the south were attempting to have the recently acquired Mexican domain organized into states all of which should permit slavery (The Clayton Compromise); were trying to have the Missouri Compromise line extended through to the Pacific; were backing Texas in her demand either for a money indemnity or the Rio Grande as a western boundary; were demanding an effective fugitive-slave law; were demanding that no free state should be admitted unless paired with a slave state. The leaders for the north were backing California's demand to be admitted as a free state; were attempting to have slavery abolished in the District of Columbia; were seeking to prohibit interstate commerce in slaves; were justifying the personal-liberty laws which made just about useless the fugitive-slave law; were resisting the demands of Texas. There was a deadlock, and to many civil war seemed certain. It was at this juncture that Clay introduced his compromise. In one form or another it was debated for nearly five months, but was finally passed about as Clay had designed it. It provided that California be admitted with her free constitution; that there should be no slavery prohibition in the organization of territorial governments founded in the Mexican domain (which included the territories of New Mexico and Utah); that Texas should receive her indemnity; that slaves might be held in the District of Columbia; that there should be no slavetrading in the District of Columbia; that the fugitive-slave law should be enforced; and that the interstate slave-trade should not be interfered with. Passed to avert a clash at arms, the measure was one of the shortest-lived and least successful compromises in history. The fugitive-slave law in its operation rapidly turned the whole north into abolitionists, and so hastened the passage of the Kansas-Nebraska bill which made the whole compromise a dead letter.

**Com'stock Lode,** a ledge of silver to which Virginia City, Nev., largely owes its growth. Discovered in 1859, the lode has yielded at times over $10,000,000 yearly. The shaft is 2,300 feet deep; but work is now only done on the upper levels, the workmen having been driven from the depths by the great heat (120° F.) and by the suffocating gas produced by the action of the air on the sulphurous rock cut at different levels.

**Comte** (*kônt*), **Auguste,** was born Jan. 19, 1798, at Montpellier, France. In philosophy he was for six years a pupil of St. Simon. In 1826 he began lectures which grew into his treatise on positive philosophy. He is the founder of that school of philosophy called positivism. Comte died at Paris on Sept. 5, 1857.

**Comus,** a masque by Milton, contains perhaps the most beautiful and tender appreciation of the beauty of purity and holiness which is to be found in all poetry. Its moral is:

> "Mortals, that would follow me,
> Love virtue; she alone is free;
> She can teach ye how to climb
> Higher than the sphery chime;
> Or, if virtue feeble were,
> Heaven itself would stoop to her."

Comus, the god of revel, is not mentioned in the classical myths; but in the 3rd century A. D. he is referred to in connection with art. In Milton's poem a maiden, parted from her brothers in the wood where Comus holds his revels, is saved from the swinish cup which is offered to her by her own constancy and innocence. Among the greatest lines are these:

"So dear to Heaven is saintly chastity,
That, when a soul is found sincerely so

A thousand liveried angels lackey her,
Driving far off each thing of sin and guilt;
And, in clear dream and solemn vision,
Tell her of things that no gross ear can hear;
Till oft converse with heavenly habitants
Begins to cast a beam on th' outward shape,
The unpolluted temple of the mind,
And turns it, by degrees, to the soul's essence,
Till all be made immortal."

**Conchology.** See SHELLS.

**Con'cord,** a town of Middlesex County, Mass., 23 miles by rail from Boston. It was settled in 1635. As early as 1767 its people took a strong stand against the measures of the British. In February, 1775, the colonial government gathered valuable military stores at Concord. British spies visited the place, and an expedition from Boston to seize or destroy the stores was decided upon by General Gage. On the morning of April 19, 800 soldiers reached Concord. The country had been thoroughly alarmed; the people were engaged in concealing stores; and the militia, to the number of 180, had gathered when the enemy came in sight. Some were for resisting them, but, desiring to throw the blame of the attack on the invaders, Colonel Barrett led his men across the North bridge. While part of the British were destroying arms and provisions, a detachment marched to secure the North and South bridges. The Americans, believing the enemy were burning the village, marched toward the bridge, while the British drew up on the east bank and began to pull up the bridge-planks. They were commanded to stop, which they did; but a single gun, followed by a volley, was fired at the Americans. The minute-men answered with a volley also, and a general fusillade ensued, both sides losing several men. The British retreated to the center of the town, the Americans following and posting themselves along the Boston road. About noon the retreat began, the minutemen pursuing the British as far as Lexington. The Revolution was really begun by the skirmish at North bridge, where, as Emerson puts it, was "fired the shot heard round the world." Concord, out of a population of 1,300, sent 174 men to the army of 1775, the town raising the soldiers' pay. Concord is noted as the home of Hawthorne, Emerson, Thoreau, Louisa M. Alcott and Channing. Population, 6,421.

**Con'cord,** the capital of New Hampshire, is on the Merrimac River and has some handsome public buildings. The city has extensive water-power. It manufactures large numbers of carriages, also shoes, twine, leather-goods, silverware, electrical apparatus, machine-shop products; and has quantities of fine granite in its vicinity. An island in the Merrimac near the city is famous as the place where Mrs. Hannah Dustin and her nurse, with the aid of a boy, in 1697 killed ten Indians who had taken them captive. Concord was the home of the Penacooks, a powerful tribe of Indians. It was settled in 1725. Population, 21,497.

**Concordat, The,** of 1801, was an agreement between Pope Pius VII and Napoleon as first consul of France. This is the most famous of many such concordats between the popes and secular rulers. By the concordat of 1801 the national Catholic church was restored to France, though its administration was henceforth more dependent upon the government. Church property which had been seized was not to be restored, but the government was to provide for the support of a reduced number of bishops. As in English history of old, it was agreed that the government should select the bishops, but the pope invest them with their office. This concordat was replaced by similar agreements under different French governments. But there always was a strong party against having any state-church; and in 1906 it was disestablished and the concordat repealed.

**Concrete,** a composition of broken rock, gravel, broken bricks, sand, etc., usually cemented into solid form by the use of hydraulic cement. The proportions of the various ingredients differ according to the use to which the artificial stone called concrete is to be put, but the principle to be kept in mind in the mixing is that there should be enough of the mortar to a little more than fill the space between the fragments of broken rock, etc. A typical concrete is made of one part of cement, three parts of sand and five parts of broken rock. The mixing is usually done dry, only enough water being used to lay the dust, but more water is added when the stuff is tamped into position. Where concrete has to be laid down under water, it is usually put in position in bags. It is used for the foundations of structures of all sorts, for piers, fortifications, sidewalks and, recently, to a great extent in monolithic buildings, that is, buildings that are virtually one stone. In such buildings, as well as in many foundations, many iron girders and rods are imbedded in the concrete to add to its strength, and this is called reinforced concrete. The great earthquake in California made apparent the superiority of this kind of construction. Concrete was used extensively by the Babylonians, Egyptians, Greek and Romans. Some of their buildings have stood over 3,600 years. See CEMENT.

**Conde** (*kôn-dā'*), **Louis II of Bourbon, Prince of,** called the Great Condé, was born Sept. 8, 1621. He early started in his soldier's career. At the age of 22 he was given command of a French army

and, against the advice of older generals who served under him, he fought the battle of Rocroi, and by skillful maneuvering and fierce charges made it a brilliant victory—the first in the reign of Louis XIV. Two hard-won victories in Germany and the capture of Dunkirk were followed by his winning the important battle of Lens in 1648, in which the formidable Spanish infantry were destroyed and the Thirty Years' War ended. The next year began the war of the Fronde, and, though Condé by his generalship had placed the young king on the throne, his pride had made him enemies at court. Soon after he was arrested, and, when set free, he at once put himself at the head of the troops of Bordeaux, which had rebelled. But he was no longer successful. Turenne defeated him twice; and, forced to leave the country and now fighting in the Spanish army, he was again overcome by the same general. Eight years afterward, having been allowed to return to France, the death of Turenne again brought him to the front. In three weeks he conquered Franche-Comté and fought William of Orange, (William III of Holland and England), though in a drawn battle which lasted for 17 hours. This was his last engagement, as the campaign had broken his health. He died Dec. 11, 1686.

**Condor,** a very large bird of prey, living in South America, usually among the peaks of the Andes. It at one time was considered the largest bird of prey, but several species

CONDOR

of the Old World are larger, and the Californian vulture reaches the same size. Before they were actually measured by Humboldt, fabulous stories were told in regard to their size and carrying-power. They were said to reach 30 or 40 feet in stretch of wing and to carry away sheep and children in their claws; but the toes are comparatively straight and the claws are blunt and not fitted for grasping. There is no authentic case of animals having been carried away by the condor. This structure of the foot makes it difficult for them to perch on trees and they prefer the bare rocks. They are sound sleepers, and may be caught with a noose while roosting. The plumage is a glossy black, with broad white bars across the wings and a collar or ruff of snow-white down around the neck. The latter is naked, and covered with wrinkled dull-red skin. They feed mostly on carrion, but are also fond of fresh meat and kill lambs, the goat and the young of cattle and deer. The white eggs are laid on inaccessible rocks, and the young cannot fly for about a year. They continue to hunt and roost with their parent for two years longer. Their plumage is brownish, and they have been called brown condors.

**Conduction** (in plants). See WATER, ASCENT OF.

**Cone** (in plants), the characteristic cluster of seed-bearing scales developed by conifers and especially by the pines and their allies. The technical name of such a cluster is strobilus. See CONIFERS.

**Co'ney Island,** southeast of Long Island and barely separated from it by a rivulet, is a narrow strip of sand, five miles long and half a mile wide. It has a fine beach, which is lined with long rows of huge wooden hotels. Its nearness to New York and Brooklyn makes it a popular resort. The east end is called Manhattan Beach, and its broad hotel-verandas, promenades and well-laid-out grounds are patronized by the well-to-do. There are two large music-halls, with fine acoustic properties, the galleries open to the air, where the best musicians of New York give cheap summer-concerts. The west end is the most democratic resort in America, and its beach, bathing-pavilions, open-air restaurants and music-halls, toboggan-rollers and iron lookout-tower, 300 feet high, are crowded all summer by thousands of the ill-housed and sweltering men, women and children of the cities. Steamboats land every few minutes during the day at the tubular iron pier, 1,000 feet long; three railroads join Coney Island to New York and Brooklyn; and one surface and one elevated road carry the pleasure-seekers from one end of the island to the other.

**Confed'erate States of America, The.** When the Republican or antislavery party gained control of the government, by the election of Abraham Lincoln to the presidency, certain of the slave-states took

steps to withdraw from the Union and establish a separate government. A convention assembled at Columbia, South Carolina, Dec. 17, 1860, but adjourned on the same date to Charleston, where, on the 20th, a resolution was passed declaring that the union hitherto existing between South Carolina and the other states under the name of The United States of America was dissolved. Other states were quick to follow. In less than six weeks Mississippi, Florida, Alabama, Georgia, Louisiana and Texas passed ordinances of secession and withdrew from the Union. On the 4th of February, 1861, delegates from six of these states met in convention at Montgomery, Alabama, and organized a new government, with the title of The Confederate States of America. On the 8th of the same month, the organization was completed by the choice of Jefferson Davis of Mississippi as president and Alexander H. Stephens of Georgia as vice-president. The seceded states at once seized, with few exceptions, all the forts, arsenals, navy-yards, military stores and other Federal property within their limits.

The Civil War followed, beginning with the attack on Fort Sumter on April 12. On the 17th Virginia seceded and joined the Confederacy. Arkansas followed on May 6, North Carolina on the 20th of the same month and Tennessee on June 6, making 11 states in all. The history of the Confederacy is confined to the years of the Civil War, and it ceased to exist with the surrender of the Confederate army at Appomattox, Va., April 9, 1865.

**Confu'cius** (*kon-fū'shē-us*), the great Chinese sage, was born in the state of Lu, in 551 B. C. His father, an old soldier, died when Confucius was three years old, leaving him and his mother very poor. For a while he had charge of the public stores and the public herds. At 22 he began his career as a teacher. In 501 a new ruler made him governor of the town of Chung-tu, where he brought about a striking reformation in the manners and morals of the people. Soon after, he became a minister of state and the most powerful man in Lu. For three years he was as successful in ruling and reforming the people as he had been when only a town-governor. Under his rule dishonesty was unknown; loyalty and good faith were the characteristics of men. Confucius was now the idol of the people. But soon a breach was made between him and his ruler, and for 12 years, with a company of disciples, he traveled through other Chinese states, teaching as he went. Sometimes the company were welcomed by high princes; at others they had not enough to eat, and even were in danger of their lives. A new ruler summoned the sage back to Lu, where he died the eleventh day of the fourth month, 479 B. C. Confucius thought his life a failure, but he was hardly dead when a temple was built in his honor, and to-day every market-town has its Confucius temple, and twice a year the emperor does honor to the greatest and wisest of Chinese philosophers. Of no ancient person do we know more than we do of Confucius. Not only what he taught, but just how he looked and acted at court, while talking to his disciples, at his table or in his bed has been handed down to us. Confucius was a great moral teacher and his supreme teaching was his negative golden rule: "What you do not wish done to yourself, do not do to others." He never pretended to be anything more than a man, but he knew the right way for each man to live and to be right himself, and for the ruler so to rule as to make men happy and good. China is his monument.

**Congo Free State** grew out of the International Association, which was formed in 1878 with King Leopold of Belgium at its head. The European powers recognized the state in 1885, and in 1890 its territories were declared inalienable, though a convention between Belgium and the Independent State reserved to the former the right of annexing the latter after a period of ten years. In 1901 this right was renewed. Treaties with various interested nations have defined the boundaries. It has a narrow seacoast, with the Congo as its northern boundary, and in the interior widens north and south, extending to Lakes Albert Edward and Tanganyika. It is governed by an official living in the country and by another at Brussels under the headship of King Leopold. The people of the Congo basin are of the Bantu race. They are harmless, and born traders, and are lighter in color than the Sudanese. The European population in 1910 numbered 3,399, chiefly Belgians, Portuguese, Italians, English and Americans. The chief districts are Boma, Bangala, Aruwimi, Lualaba, Kwango, Equator, Ubangi and Stanley Pool. The area is estimated at 900,000 square miles. Population possibly 15,000,000 or 16,000,000.

There has been a rapid expansion of commerce, and it is being pushed and developed with full regard for the welfare of the country. In 1905 the imports were 45,961,295 francs and exports 121,573,949 francs. (The franc is about 19 cents.)

The chief imports are fabrics, food, machinery, steamboats, drink, metals, arms and ammunition; the exports consist of rubber, ivory, palm-nuts and oil, white copal, coffee and cocoa. Tobacco is being successfully grown. A railway of about 250 miles connects Matadi with Stanley Pool. A local railway of 50 miles is open for traffic in Mayumbe, and a Belgian company is constructing 900 miles of railway from the Congo

at Stanleyville and Nyangwe to Lakes Albert and Tanganyika. Over 100 miles of this already are open. Thirty-two steamers ply the upper Congo. Telegraph lines connect Boma and the Equator by way of Leopoldville, 744 miles long, Kasonga and Baroka on Lake Tanganyika, 200 miles, Lisala and Umangi, 14 miles, and some 50 miles in Mayumbe, a total of 1,008 miles.

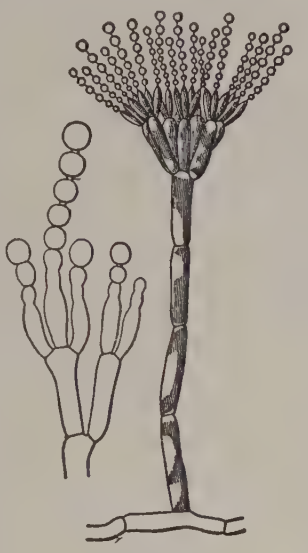
**Con'go, French.** See FRENCH CONGO.

**Con'go, The,** is the great river of equatorial Africa and the second largest river in the world. Its mouth was discovered by Diego Cam in 1482, who set up there a pillar and called it the Pillar River. The Portuguese following him did not go far into the interior, and called it the Zaire, a native word meaning "the river." The country thereabout was called the Congo, and the mapmakers gave the name to the river. Captain Tuckey, in 1816, wished to see if it was not a mouth of the Niger, and with his boats went up the first navigable part, 110 miles; but many of his men sickened and died, and for half a century the river was avoided by all but the hardy slave-traders. Livingstone, between 1867 and 1871, while exploring between Lakes Nyasa and Tanganyika, found a large river flowing to the north, which he thought to be the Nile. Five years later, Stanley, exploring in the same lake-region, gazed on the mighty stream, and, following its course to its mouth, proved it to be the Congo. Lake Bangweolo is the reservoir from which the Congo issues, called there the Luapula. Flowing north, it widens into Lake Moero; from here, as far as Nyangwe, its name is the Lualaba; from Nyangwe to Stanley Falls Stanley named it the Livingstone; and from Stanley Falls to its mouth it is known as the Congo. It is 3,000 miles long, and drains an area of 1,600,000 square miles. It discharges a body of water into the Atlantic second only in volume to the Amazon. Its two largest branches are the Kasai from the south and the Mobangi from the north. The Congo is divided into the lower, the middle and the upper river. The lower river is navigable for its entire length up to the rapids, a distance of 110 miles, for steamers of 18-foot draught; the middle river is unnavigable through the cataract region, extending 255 miles to Stanley Pool. The upper river, as far as Stanley Falls, is navigable for 1,068 miles to steamers of four-foot draught.

**Cong'ress of the United States,** the legislative or law-making body. There are two houses, the house of representatives and the senate. The senate is made up of two members from each state, chosen by direct vote. (See U. S. p. 1974) for six years. One third of the senate goes out of office every two years. The senators now (1912) number 96. The representatives are chosen directly by the people every two years, the number of members from each state depending upon its population. A new apportionment is made every ten years in accordance with the decennial census. On the basis of the census of 1910 there is one representative to every 211,430 inhabitants. The house at present has 435 members. The vice-president of the United States is president of the senate; the house chooses its own speaker. All money or appropriation bills must originate in the house. The senate has sole power of impeachment and of confirming or rejecting important appointments made by the president. Besides its legislative functions the senate is intrusted with the power of ratifying or rejecting all treaties made by the president with foreign powers, a two thirds majority of senators present being required for ratification. Congress lasts two years, and has two sessions, both commencing the first Monday in December. The first is called the long session, and lasts from seven to nine months, adjourning on a day agreed upon by the two houses; the second, called the short session, lasts until March 4, at 12 noon. Every bill which passes the two houses, is sent to the president for his approval or disapproval. In the latter case he vetoes it, that is, returns it with his reasons to the house where it originated; if it is passed again by a two-thirds majority in both houses, it becomes law. The powers of Congress are limited and separated from those of the state legislature by the federal constitution. By the 5th article of the constitution, Congress has the power to propose alterations in the constitution. The emoluments of a senator and representative in Congress, as fixed in 1907, are $7,500 a year, with traveling-expenses. The speaker receives $12,000. There also is an allowance each year to members for stationery and similar expenses. The representation of the various states in Congress in 1912 is as follows: Alabama 10; Arkansas 7; California 11; Colorado 4; Connecticut 5; Delaware 1; Florida 4; Georgia 12; Idaho 2; Illinois 27; Indiana 13; Iowa 11; Kansas 8; Kentucky 11; Louisiana 8; Maine 4; Maryland 6; Massachusetts 16; Michigan 13; Minnesota 10; Mississippi 8; Missouri 16; Montana 2; Nebraska 6; Nevada 1; New Hampshire 2; New Jersey 12; New York 43; North Carolina 10; North Dakota 3; Ohio 22; Oklahoma 8; Oregon 3; Pennsylvania 36; Rhode Island 3; South Carolina 7; South Dakota 3; Tennessee 10; Texas 18; Utah 2; Vermont 2; Virginia 10; Washington 5; West Virginia 6; Wisconsin 11; Wyoming 1; Arizona 1; New Mexico 1.

The first colonial congress met in New York, Oct. 7, 1765, made up of delegates from nine colonies. A second congress, which met at Philadelphia, July 5, 1774,

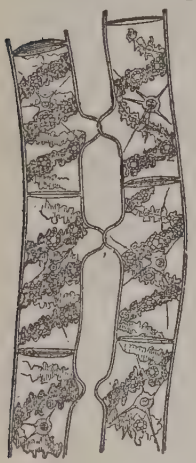
representing all the colonies but Georgia, set forth the well-known Declaration of Rights. This body became known as the Continental Congress, and on July 4, 1776, adopted the Declaration of Independence. The first congress of the United States met in New York in 1789 with 26 senators and 65 representatives. The next year it moved to Philadelphia, and in 1800 to Washington. See Woodrow Wilson's *Congressional Government;* Cooley's *Constitutional Limitations;* Von Holst's *Constitutional Law of the U. S.;* and Bryce's *American Commonwealth.*



CONIDIA

**Conid'ia** (in plants), asexual spores of certain fungi, which are formed by cutting off a series of cells from special branches of the mycelium, resulting in more or less extensive chains of spores which separate easily. Such spores are well displayed by the mildews and the æcidium forms of rusts. They are often called conidiospores. The singular of the name is conidium.

**Co'nifers,** the greatest group of living gymnosperms, containing such plants as the pines, spruces, hemlocks, firs, redwoods, cedars, cypresses, junipers, yews. The species are characteristic of the temperate regions of the northern and southern hemispheres, and are almost entirely absent from the tropics. Among them are some of the most valuable timber-trees, and the yearly inroads upon them for lumber, unless properly controlled, will result presently in their extinction. Their most characteristic features are the central shaft which never breaks up into branches the evergreen needle-leaves, the cones and the soft and very evenly-grained wood. They are a very ancient group, their remains occurring in great abundance in the earlier rocks. See GYMNOSPERMS.



CONJUGATION OF TWO FILAMENTS OF SPIROGYRA

**Con'jugate Plants,** a group of the green algae, in which different plants become united together by connecting tubes, through which fertilization is effected. The common pond-scum or *Spirogyra* is an example. See CHLOROPHYCEÆ.

**Conjuga'tion.** A process of fertilization occurring in certain of the lower plants (*Thallophytes*), in which the sexual cells (*gametes*) which unite to form the spore are alike in appearance, there being no distinction of male and female.

**Conk'ling, Roscoe,** American politician, was born at Albany, N. Y., Oct. 30, 1829; and died at New York, April 18, 1888. In 1846 he removed to Utica, N. Y., where he became district attorney, and was mayor in 1858. He was elected to Congress, and in 1879 to the Senate. In the practical business of both houses he took an active and prominent part, serving on important committees, and was instrumental in securing much useful legislation. He took an active part in the reconstruction of the southern states, and advocated resumption of specie-payments. He opposed President Johnson's policy and zealous championed Grant's administration; and in June, 1880, nominated Grant for a third term. In 1881 he resigned his seat in the senate, owing to Garfield's exercise of control over appointments in his native state. In 1882 he was appointed associate-justice of the supreme court but declined. See his *Life and Letters.*

**Connaught, Arthur, Duke of,** Governor General of Canada (1911-1916), is the third son of the late Queen Victoria of England. Both in character and attainments, the duke was regarded as eminently qualified for the chief executive of the Dominion. Before his appointment he had served with distinction in the British army, traveled widely and availed himself of the opportunity to study the affairs of the empire at first hand. He was born in 1850. The duchess was Princess Louise of Prussia. The duke commanded the Guards brigade at Tel-el-Kebir and was mentioned three times in the dispatches.

**Connecticut** (*kŏn-nĕt'ĭ-kŭt*) (name derived from Indian word meaning land on the long tidal river occupies the south western corner of the New England states. Its northern boundary is Massachusetts, 88 miles, its eastern, Rhode Island, 45 miles, western, New York, 72 miles. On the south 100 miles of irregular coast afford numerous good harbors, the best of which are New Haven and New London. The area of the state is 5,004 square miles. The census of 1900 gave a population of 908,420. A school census in 1907 showed a population of 1,037.614, and the census of 1910 gave a population of 1,114,756.

The rivers are the Connecticut, navigable to Hartford, the Housatonic and the Thames, navigable through the tidewater. The various tributaries are the Farmington, the Naugatuck, the Shepaug, the Willimantic, the Quinnebaug and the Shetucket.

Ranges of hills cross from north to south, dividing the state into the eastern upland, the central lowland, the western upland and, south of these, the coast section. The rounded and fertile hills of the eastern upland have a lower average elevation than those of the western section, which in the extreme northwestern corner reach the height of 2,355 feet. The hills of the western upland are rugged and steep, broken by bold bluffs of trap-rock.

Nearness to the ocean renders the climate less severe than that of inland states of the same latitude. The weather is changeable. The mean annual temperature is 50°.

The geological formation of the state is interesting. Ridges of trap-rock are numerous through the central portion. These ridges, forced up through red sandstone, slope abruptly to the west and gently to the east. Copper and lead, both combined with silver, are found in Hartford County. Copper was formerly mined, the first copper cents used in America being made from Connecticut copper. Later the mines proved unprofitable and were abandoned. In the western part of the state a rich deposit of iron has been mined since 1730. Limestone, marble, brownstone (freestone), granite and slate are quarried. The timber includes hickory, oak, chestnut, butternut, beech, birch, maple, ash, elm. Much valuable forest-land remains, in spite of the large tracts which have been cleared. Scientific protection and increase of forests are encouraged by a state-forester and the Yale school of forestry.

Four causes combine to make Connecticut prominent as a manufacturing state: the favorable location geographically, ease of transportation by land and water, excellent water-power and the inventive genius of the people. Among the manufactured products are small hardware of all sorts, machinery, india-rubber goods, paper, silver-plated ware, hats, clocks and watches, thread, musical instruments, typewriters, sewing-machines, firearms and ammunition carriages, bicycles and motor-vehicles, cotton and woolen-fabrics and silk-fabrics. One large shipyard and two smaller ones do a considerable amount of shipbuilding. The New York, New Haven and Hartford Railroad, with its branches and trolley-lines, covers the state. Steamers run from New York to New Haven, New London, Bridgeport and Hartford.

Agriculture is second in importance among the industries. Of the crops raised, hay is the most valuable and has the largest acreage. The soil of the upper valley of the Connecticut is a deep, rich loam, especially suited to tobacco-raising. Much tobacco is raised here and in the Housatonic valley. The highlands are devoted largely to dairy-farming, the west and southwest to market-gardening. Orchard-fruits are an important crop. Fishing for bluefish is followed along the shore, where there are also valuable shell-fisheries. The Connecticut yields a fair catch of shad.

*History.* The first permanent settlements were made at Saybrook (1635), Hartford (1636) and New Haven (1637). Prominent men of this period were the Rev. Thomas Hooker and the Rev. Samuel Stone, who led about 100 men, women and children from Massachusetts to Hartford; John Winthrop, jr, afterward governor, who was commissioned by Lords Say and Brook to establish a fort at the mouth of the Connecticut, named Saybrook for its owners; and the Rev. John Davenport and Theophilus Eaton who founded the New Haven colony. The Indians of the Pequot, Narragansett and various smaller tribes were practically exterminated by the settlers in 1637.

Connecticut is known as the Constitution State from the fact that almost the first constitution adopted by vote of the people was drawn up and adopted by the Connecticut colony in 1639. In 1662 Gov. John Winthrop, jr, obtained a charter from King Charles II granting to the colony an unusual degree of independence. The hiding of the charter in an oak must be relegated to legend. It was, however, not surrendered at the demand of Sir Edmund Andros, royal governor of New England, but was withheld until 1689, when it was produced and the colonial government re-established. The charter provided the accepted form of government until the adoption of the present constitution in 1818. Its terms and forms have been largely preserved in the constitution, and still are the organic law of the state. A convention held in 1902 to consider the revision of the constitution accomplished nothing. Representation under this constitution is institutional, the towns in existence in 1818 having two representatives each, the towns incorporated later having one or more representatives as the population is below or above 5,000. The system has proved efficient and has worked no injustice.

The state furnished 40,000 soldiers during the War of the Revolution. Jonathan Trumbull, then governor, was a valued friend and adviser of Washington. William A. Buckingham, governor at the outbreak of the Civil War, made the record of the state in that war remarkable for promptness and zeal. Nearly 55,000 volunteers went from Connecticut.

Immigration has changed the character of the population to a considerable extent in recent years. It is now 1,254,926.

*Education.* Supervision of the public-school system is in the hands of a board appointed by the legislature. Financial assistance of the towns is provided by a fund derived from the sale of Connecticut's share of land in the Western Reserve and by high-school grants, larger and more generally applicable than in any other state. The minimum school-year covers 36 weeks, the longest required by any state. Enforcement of child-labor laws is under the charge of the state board of education, and attendance laws are rigidly observed. Higher institutions of learning include Yale University, New Haven; Wesleyan University, Middletown; Trinity College, Hartford; Hartford Theological Seminary, Hartford; and Berkeley Divinity School, Middletown. The state maintains normal schools at New Britain, New Haven, Willimantic and Danbury. An agricultural college is maintained at Storrs by funds obtained in part from the U. S. government and in part from the state.

**Connect'icut River,** the largest in New England, is 450 miles long and is navigable to Hartford. It rises in New Hampshire, forms the boundary line between that state and Vermont, crosses Massachusetts and Connecticut, and enters Long Island Sound. Its many falls afford abundant water-power, and along its whole course it is noted for its beauty.

**Connec'tive** (in plants). That part of an anther which lies between the pollen-sacs. See FLOWER.

**Con'nellsville, Pa.,** situated in the southwest of the state, about sixty miles southeast of Pittsburg, is the center of the United States coking-coal trade. It may be visited by branches of the Pennsylvania and Baltimore and Ohio railroads. In addition to the coking-coal industry, it has steel mills, coal-mines, brick-works and pump and machine-works. Population 15,000.

**Conrad, Timothy Abbott,** an American paleontologist, was born in New Jersey in 1803, and died at Trenton, N. J., Aug. 8, 1877. Early in life, his attention was drawn to the geological features and crust-depressions in the western plains, while on surveying expeditions and while acting as paleontologist of the N. Y. geological survey. His published works include *Fossil Shells of the Tertiary Formations of North America, New Fresh-Water Shells of the United States* and *Paleontology of the State of New York.*

**Conservation of Energy.** The fact that energy is conserved or preserved without loss or gain, where to all appearance there are successive loss and gain of energy, is well-shown in the pendulum. By energy we mean capability to do work. When the pendulum is at the height of its swing, it may be said to be stationary. Though it seems then to have no energy, yet, owing to its elevation, it has *potential* energy, for it has the capacity to move with constant acceleration down to the bottom of its swing. There it is moving at its maximum rate, and has a maximum of kinetic energy or energy of motion, though it has lost the potential or static energy with which it started, which was due to its position and the attraction of the earth. This kinetic energy is enough to carry the pendulum up to a similar position on the other side. There again the kinetic energy has disappeared, for the pendulum is, as it were, still, but the same amount of potential energy is present as at first, for the pendulum is now ready to move as at first, though in the opposite direction. The pendulum, considered as a pendulum, now has potential energy equal in amount to the kinetic energy which it had before; for it has the power to move the same weight (*i.e.*, its own weight) through an equal distance, at the same average rate, as when it was moving at the bottom of its swing. So, at every point in the swing, the loss of potential energy is made up by an equal gain in kinetic energy, and *vice versa.* It is true that a pendulum will, after a time, stop swinging. But this is because forces outside it are acting upon it. There are the friction of the point on which it swings and the resistance of the air, etc. But the original energy of the pendulum is not lost. For, if we measure the energy of the heat which the friction and the resistance cause and the energy of the other motions of the air, etc. caused by the pendulum while it was swinging, we shall find that in that heat, motion, etc. there is just the same amount of energy, kinetic or potential, as that with which it started. The pendulum, its fulcrum or point of support, the air, the earth, etc. here form a conservative system. For any system of bodies, where the sum of the energy which its parts possess remains unchanged (through whatever changes, in position or motion, those parts may have passed) is a conservative system. Every system of bodies that so far has been studied with respect to its energies has been found to be a conservative system. If we *assume* that the universe is fundamentally a system of material bodies and that it obeys, as a whole, the same laws of conservation that we observe in its parts, then the energy of the universe, of course, is always the same. That it always is the same is the *theory of the conservation of energy.* It is a theory, and not a fact of observation.

The *proof* of the conservation of energy depends upon our power to change one form of energy into another and to bring them all to one standard of measurement. The common standard of measurement for all energies is the erg, which is based upon

the force found necessary to produce upon a gram of matter a velocity of one centimeter a second. The form of energy to which all other energies can be reduced is that of heat. The proof, therefore, of the conservation of energy in any system depends upon the measurement of heat in terms of motion. That heat could so be measured was advanced as a theory by Count Rumford and Sir Humphrey Davy in 1798, and by Julius Robert Mayer in 1842; but it was first publicly demonstrated by James Prescott Joule in 1843. In 1845 he was able to state that the energy required to heat one gram of water at 1° C. is the same as that required to lift about 423 grams to a height of one meter. This result is very near that which is at present accepted.

According to the theory of matter which regards it as composed of very small particles moving and attracting one another, all potential energy is a kind of *strain*. There are strains of extension, of compression and of distortion, of electrification, of magnetization, of chemical separation and of gravitation. Perhaps all these may really be called strains of distortion. Kinetic energy may be of the following kinds, all of which are regarded as forms of motion: translation, rotation, vibration; and, as subclasses of these, heat, current-electricity, light, chemical activity, emanation (as in radio-activity) and probably other forms of motion. Now it seems that all these forms of energy, potential and kinetic, are transformable into heat; but heat is transformable into other kinds of energy only when there exists a difference of *temperature* between different parts of a system. Wherever, in any system, differences of temperature are in whole or in part removed, therefore, the energy of heat which that system contained is in whole or in part changed from being available into a condition of being unavailable for transformation into any other kind of energy. Now in any and all systems, in whatever processes they undergo, *there takes place this transformation of available into useless energy*. The useless energy is called the entropy of the system.

The theory of the conservation of energy is not understood until it is supplemented by this theory of the destruction or dissipation of *available* energy in all systems and throughout the universe. The grandest application of this theory open to us is undoubtedly the recognition of the sun and the earth, together with the surrounding ether, as a conservative system. Then the transformation of the heat of the sun into light, into the uplift of waters from the oceans, into the chemical energy of plants and of animals, into the resultant deposits of sediment and the erosion of mountain-ranges, into the heat of coal and the energy of Niagara, with all the applications of these forces to meet human necessities; the spectacle of all these countless changes and productions is dominated by the thought that of the energy thus poured forth none is lost, but abides in a potential or a kinetic form. And yet the *available* energy is continually diminished, as these changes, one and all, end their career in the form of heat, thereby continually diminishing the difference of temperature between the sun and that which surrounds it. Nevertheless we must remember that, admirable and consistent as these theories of conservation and entropy appear, they are subject to revision with the advance of knowledge and of mechanical art. PERCY HUGHES.

**Con'stable, John,** an English landscape-painter, was born in 1776 and died in 1837. He entered the Royal Academy when 23 years old, but his progress was slow. Not until 1814, 12 years after he had begun to exhibit pictures, did he succeed in selling one. But in 1819 his *View on the Stour* attracted much attention, and his reputation spread widely. His pictures are remarkable for the truth and vividness with which they reproduce country-scenes and the phases of nature. A French critic said that their leaves and grass are fresh with dew, and Fuseli jokingly asserted that they made him call for his umbrella. Among his best paintings are *Salisbury Cathedral*, *The Cornfield*, *The Lock* and *The Valley Farm*

**Con'stance, Lake,** lies 1,290 feet above the sea, between Switzerland and Germany, north of the Swiss Alps. It is forty-two miles long and seven and a half miles in average width, covering an area of 208 square miles; its greatest depth is 906 feet. The Rhine flows through it from east to west. The shores are formed by hilly lands; cornfields, vineyards, orchards and wooded hills, with here and there a ruined castle, surround the lake. The water is dark green, and in the spring often rises ten or twelve feet after a thaw. The fisheries are important.

**Constantine I** (*kŏn'stan-tīn'*), Roman emperor, called the Great, born 274 A. D., was the son of Constantius Chlorus. When 22 years old, he served as a soldier in Egypt and in Persia. In 305 Constantius and Galerius became emperors respectively of the west and the east. Constantine was now in the army of Galerius, who saw a possible rival in the young leader's brilliant genius and popularity among the soldiers, and so took every means to place him in danger. But Constantine hastily joined his father in the west, and on his death succeeded him in 306. However, things got into a muddled condition two years later, for six emperors were ruling at once, three in the east and three in the west. Constantine thus found himself opposed by two

rivals, Maximian and Maxentius, father and son. The father took refuge in Marseilles, and, when about to be given up by the people, killed himself. The son gathered a large army, but Constantine, quickly crossing the Alps by the Mt. Cenis pass, worsted him twice, and utterly crushed him in the battle of the Milvian Bridge in 312. It is asserted that Constantine, while on the march and near the Alps, saw a flaming cross in the sky, with the inscription: "By this, conquer." During the rout Maxentius was forced off the bridge and drowned. The night before the battle, it is said, Constantine saw a vision, in which he was told to place the monogram of the name of Christ on his soldiers' shields. In this way the standard of the cross came (after 323) to be borne by the Roman soldiers; and a year later, the eastern emperor, Licinius, joined with Constantine in granting Christians freedom of worship and the rights of Roman citizens. That Constantine became a Christian himself at this time is doubtful; but during his reign Christianity was made the state-religion, the heathen temples were closed, and toward the end of his life the great emperor was baptized. Linicius, now sole ruler in the east, was next conquered and put to death, and in 330 the western emperor, now sole master of the Roman world, made Byzantium his capital, changing its name to Constantinople, the city of Constantine. He died May 22, 337.

**Constantine I.** of Greece, who succeeded his father King George (*q. v.*), was forced by the Allies to abdicate in favor of his second son Alexander in 1917. He was born August 3, 1868, and was married in 1889 to Sophia, youngest sister of Emperor William of Germany. The action taken by the Allies was due to his alleged pro-German activities. His eldest son, Crown Prince George, was excluded from succession for a similar reason.

**Constantino'ple,** capital of the Turkish empire, called Stamboul by the Turks, was formerly the ancient town of Byzantium and capital of the Byzantine or Eastern Empire. A colony from Megara settled it about 658 B. C., and its commanding position caused it to be fought for by Persians, Gauls, Greeks and Romans. In the fourth century Philip of Macedon lay siege to it, but was driven off by an Athenian army. The story is that the Macedonians' whereabouts was discovered by a crescent which shone out in the sky; so, ever since, a crescent has been the badge of the city. In 330 A. D. Constantine was so taken with its fine site that he made it his capital, giving it his own name, by which it is now known. Of the 26 sieges and eight captures it has suffered, that by the crusaders in 1204 was the worst, when all that was beautiful in the city, the church-treasures and even the bodies of the dead were plundered. In 1453 Constantinople fell before the conquering Turk and has never been besieged since, chiefly, in modern times, because of the renown of the Ottoman empire and, later still, because of the jealousy of the European powers, which would not allow any one of them to capture the prize of the Bosporus.

Stamboul or Constantinople proper stands on the site of old Byzantium, south of the Golden Horn, a creek five miles long, half a mile broad and deep enough to float near to the shore the Turkish ironclads. The 14 miles of walls first built by Constantine still encompass the city. Stamboul, like Rome, has its seven hills, where over 200 beautiful mosques and countless chapels rise from a mass of tumble-down, ill-smelling wooden houses and long rows of picturesque bazars. There are many suburbs, including Eyyub, where is the mosque in which every sultan must gird on the sword of Osman before he ascends the throne. No Christian is allowed to approach the holy place. The trade of Constantinople is large and mostly in the hands of Europeans. There are 20 miles of fortifications along the Bosporus. Railroads now connect Constantinople with Paris and other European cities and also with towns in Asia Minor. Population, 1,200,000.

**Constitution, The,** or **Old Ironsides.** A famous American naval vessel. A 44-gun frigate of 1576 tons, she was launched Sept. 20, 1797. She took part in the operations against the pirates in the Mediter-

ranean in 1803—the recapture of the Philadelphia and the bombardment of Tripoli. In the war of 1812, she brought renown to the American Navy. Aug. 19, 1812, under Capt. Isaac Hull, she fought and destroyed the British ship Guerriere and Dec. 29, of the same year, under Capt. Bainbridge, she won a hard fought battle with the Java, which she destroyed. Under Capt. Stewart she captured four prizes in 1814, and Feb. 20, 1815, she captured, after a terrific fight, the Cyane and the Levant. In 1830 she was condemned to be broken up, but Oliver Wendell Holmes published his thrilling poem "Old Ironsides," which aroused public protest, and the grand old ship was saved. She was rebuilt and did further service, crossing the Atlantic for the last time in 1878. In 1897 she was retired to the Boston Navy Yard, where she did service as a barrack ship.

**Consul, Mercantile,** the name given to those officers a nation maintains in a foreign country for the protection of its trade and the rights of its merchants and to whom the further duty is assigned of keeping the home-government informed of all facts bearing on the commercial interests of the country. The practice of maintaining these consular agents had its origin among the trading cities of Italy in the 12th century. It has since gradually widened, and in the 16th century had become a regular custom throughout Europe. The consul's first duty on reaching his post is to show his commission to the authorities of the country and receive their sanction of his appointment. This sanction is called an *exequatur* —from the Latin word meaning to perform or execute. Consuls attend mostly to commercial affairs, such as examining and viséing a ship's papers, taking note of losses at sea, providing for disabled seamen, making regular reports on prices of crops; while in some half-civilized countries the consul is a judge. Treaties are made giving the consular court power to settle all disputes between citizens of his own country. This is usually the case in some North African and Asiatic states, where the lives and property of foreigners could not safely be left to depend on their poorly carried-out laws. In 1908 Congress passed a law for the reorganization of the American consular service, which had fallen far behind the commercial requirements of the times, and the law took effect on July 1.

**Consumers' League.** The consumers' leagues are organizations, chiefly of well-to-do women, to encourage proprietors of retail stores and of factories to treat their female and child employees well. The first league was formed in England in 1890, but the Consumers' League of the City of New York was organized next year. It was incorporated in 1898. Besides 63 leagues in 22 states, there are now *national* consumers' leagues in France, Germany and Switzerland as well as in America. The *National* Consumers' League deals with *factories*, and issues a label certifying that the goods have been manufactured in factories where the state's factory-law is obeyed, where ten hours are the maximum day's labor, where children under 16 are not employed, and where the inspection of the Consumer's League is welcomed. It also works for the passage of state and national laws to improve the condition of factory workers, especially of women and children. Its main office is 105 E. 22d St., N. Y. City. Mrs. Florence Kelly, the general secretary, is inspector and missionary for the league. Its work has been heartily endorsed by the president of the United States.

The state and city leagues adopt the regulations of the National Consumers' League, regarding the manufacture of goods; and also aim to improve the condition of retail stores, by drawing up a list of "fair houses," where proper conditions prevail. Members of the leagues give these stores the preference. Stores where men only are employed are not taken under consideration.

**Contin'ua'tion-Schools,** in the proper sense of the term, have scarcely any place in systems of public instruction in the United States. But, on the one hand, the need of such schools in order to supplement the education gotten in day schools either by liberal or vocational training is being more and more urgently felt; and, on the other hand, a beginning has been made by the Young Men's Christian Associations and by private enterprise. The evening-schools which are being conducted in connection with many city-school systems are at present little more than schools for the illiterate; but genuine continuation-courses are already being offered in them to a small extent in New York City and elsewhere. Such continuation-work as is to be had is patronized chiefly by apprentices, assistants in business houses and offices and machine-operators. There is need of more advanced training for journeymen and skilled workers. It is clear that vocational training is felt to be the essential function of the continuation-school. The older method of apprenticeship has well-nigh disappeared, and only the continuation-school can take its place and improve upon it.

Probably Massachusetts has done more than the other states in the direction of providing continuation-schools which are more than mere evening-schools for illiterates. Most important is the success of her three state textile-schools at Lowell, New Bedford and Fall River. In 1906 these three schools had an enrollment of only 167 day-students, but there were 1,419 evening-students.

During a little over ten years attempts have been successfully made by the Young Men's Christian Association to found continuation-schools. There now are 400 of these schools in the U. S. under local or state supervision. Several business and manufacturing firms, such as the Boston Elevated Railway Company, the New England Telephone and Telegraph Company and the Edison Company, have contributed largely to the support of the continuation-schools conducted by the Y. M. C. A. Rather more doubtful is the value of the correspondence-schools which are for many workers the sole vehicles of continuation-work. These schools are often efficiently conducted; but their method is apt to be discouraging and their management mercenary.

In Germany continuation-schools developed from the attempt made by the Sunday-schools in 1760 to extend their teaching to primary secular subjects. An impetus was given to the movement by the foundation of free schools for the workers, first by Berlin and later by other cities. The modern German *Fortbildungschulen* or continuation-schools, numbering 3,000 in Prussia and four times that number in the empire, are one secret of the industrial advances of modern Germany. France has several kinds of continuation-schools, especially commercial schools and polytechnics. The English continuation-schools are largely of an advanced and secondary character. There are systems of continuation-schools also in Italy, Switzerland, Holland, Sweden and Australia; designed to meet the same problem of providing liberal and vocational training for those whose days are filled with toil. See CORRESPONDENCE-SCHOOLS.

**Convolvulus, Wild Morning-Glory,** a common white or pink-and-white wild-flower of wayside wall and bank. It is much like the cultivated morning-glory of the home-garden, but is a hardier plant; the flowers are less frail and remain open longer, and it is perennial. It is also called Hedge-Bindweed, also Lady's Night-cap. It grows as far south as North Carolina and west to Nebraska, and blooms from June to August. It is a rapid grower and a great twiner, the Latin name *Convolvulus*, meaning little twiner. On moonlight nights the flower remains open, giving welcome to visiting moths. To the *Convolvulus* family belongs the sweet-potato vine; and also a member of this family is that bane of the farmer, dodder, small or field bindweed.

**Cook Islands.** Capt. Cook in 1773 discovered a number of islands between 8° and 23° south latitude and 157° and 170° west longitude. These number six principal and a number of smaller islands, which with several others were attached to New Zealand for administrative purposes in June, 1901. Rarotonga, the chief island, is 20 miles in circumference and has 2,060 inhabitants. The total population is 6,324.

**Cook, Frederick Albert,** American physician and explorer, was born at Calicoon Depot, Sullivan Co., New York, June 10 1865. He was graduated from the University of New York in 1890, and received his medical degree from the same institution. He was surgeon of the Peary Arctic expedition, in 1891–2, and surgeon of the Belgium Antarctic expedition 1897–9. In 1903-6 he explored the mountain regions of Alaska and claimed to have ascended Mt. McKinley. He is the author of *Through the First Antarctic Night* and *To the Top of the Continent.* In July, 1907, he sailed north in a fishing schooner, reaching Smith Sound where he wintered. On Feb. 19, 1908, he started with a sledge train for the pole. In Sept., 1909, he returned to civilization and announced that on Apr. 21, 1908, he had reached the north pole, where he spent two days in taking observations. His proofs, submitted to scientists of Copenhagen University, did not stand the test of examination and his claim was discredited. See *Polar Explorations.*

**Cook, James, Captain,** a great English navigator, was born Oct. 28, 1728, the son of a farm-laborer. In 1755 he entered the royal navy and became a master-mariner, and at this time surveyed the shores of Newfoundland and the St. Lawrence. In 1768, as lieutenant in command of a ship, he sailed to Tahiti with an expedition to observe the transit of Venus. On the return voyage he sailed around New Zealand for the first time, mapped its coasts and explored the east side of Australia.

His second voyage was spent exploring the lands of the Antarctic on the edge of the sea of ice.

His third voyage was made as captain in charge of two ships. After discovering Hawaii, which he named the Sandwich Islands, he followed the North American coast, trying to find a northwest passage from the Pacific to the Atlantic. He reached Bering Strait, but, forced to turn back, he made Hawaii in 1779. Here he was murdered by the islanders Feb. 14, 1779. Captain Cook, perhaps more than anyone else, added to our knowledge of the Pacific and Antarctic Oceans. His surveys also have stood later tests and been found accurate.

**Cooley, Thomas McIntyre,** American jurist, was born at Attica, N. Y., Jan. 6, 1824; and died at Ann Arbor, Mich., Sept. 12, 1898. He studied law and in 1846 was admitted to the bar; in 1859 be became professor of law in the University of Michigan; and, with an interval of some years when he was chief-justice of the supreme

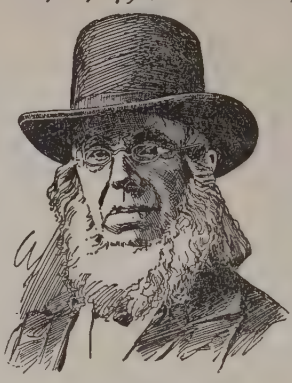
court of his state, he returned to his university professorship as dean of the school of political science and lecturer on constitutional and administrative law. Between 1887 and 1891 he served as chairman of the interstate commerce commission. He was an able and industrious writer of legal text-books, which have become standard authorities; the chief of these are *The Constitutional Limitations which Rest upon the Legislative Power of the States of the American Union; The Law of Taxation; Wrongs and Their Remedies;* and *The General Principles of Constitutional Law in the United States.*

**Cooper, Sir Astley,** an English surgeon, was born at Norfolk, Eng., Aug. 23, 1768. He began the study of surgery in London when 17. Appointments at hospitals and professorships followed. His books made him famous. From 1804 to 1807 was published his work on *Hernia;* his great work on *Dislocation and Fractures* appeared in 1822. He was the first to attempt the tying of the carotid artery and the aorta, though he was not successful in either. He also removed a tumor from the head of George IV, who thereupon made him a baronet. The vice-presidency of universities, degrees, memberships and offices in scientific societies were showered upon him. Besides his fame as a surgeon and as a writer on surgery, he was very successful as a teacher, implanting knowledge in an easy and agreeable manner. He also made surgery which before his time had in large measure been dangerous guesswork, a science. He died Feb. 12, 1841.

**Cooper, James Fenimore,** American novelist, was born at Burlington, N. J., Sept. 15, 1789. After three years at Yale he entered the navy, rising to the rank of lieutenant. His first novel was a failure; but in 1821 *The Spy* made him popular. Following this came *The Pioneers,* the first of the famous *Leather-Stocking Tales.* In 1823 appeared *The Pilot,* the earliest of his sea-tales. Throughout his life he was a busy writer, now correcting the false impressions of his country which he found current in Europe, now writing a novel to give expression to his views of politics, now ridiculing his countrymen's faults and anon bringing out sketches of travel. But his fame rests on his early novels, the best of which have been translated into most of the languages of Europe and into some of those of the east. He, practically, was the first American in American literature. He died Sept. 14, 1851.

JAMES F. COOPER

**Cooper, Peter,** was born at New York, Feb, 12, 1791. His father, who had been a lieutenant in the Revolutionary War and was a hat-manufacturer, was not successful in business, and had a large family to provide for. So Peter's boyhood was one of hard labor. He went to school half of each day for a single year. When 17, he was apprenticed to a coachmaker, and pleased his employer so much that he offered to set him up in business, which he declined. After trying different branches of trade, he began the manufacture of glue and isinglass, which he carried on for 50 years. Seeing what profits could be made in iron, he built several mills. In 1845 he erected at Trenton, N. J., the largest rolling-mill at that time in the country for the manufacture of railroad-iron. He first succeeded in using anthracite coal in puddling iron; was the first to roll wrought-iron beams for buildings; and also designed and built the first locomotive made in America. which was used on the Baltimore & Ohio Railroad. In his own youth Cooper had greatly felt the lack of means of study in the line of his trade, and he determined that other artisans should have a better chance. So Cooper Union, to which Mr. Cooper gave $800,000 in all, was built. It covers a whole block in the center of New York city. Here young mechanics and others receive night-lessons in engineering, mining, metallurgy, chemistry, architectural drawing and building. There also are schools of design, telegraphy, wood engraving, photography, etc. The Union is free to all who choose to attend. Besides the school proper there are free lectures, a free library and reading-room, art-galleries, models of inventions and



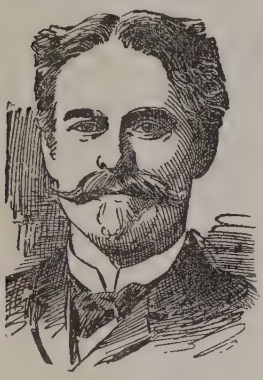
PETER COOPER

AMERICAN COOT

other facilities and equipments. Cooper died April 4, 1883.

**Coot,** a water-bird, also called mudhen and crow-duck. It differs from the rail in having lobed toes, which assist in swimming. It is about 14 inches long, with a short tail, with a slaty-black plumage and some white marks near the tail. The bill is pointed and ivory-white, distinguishing it from the duck. It breeds in bogs, and frequents quiet pools and rivers, but prefers the neighborhood of small muddy ponds. The food is water-insects, small fish, worms, seeds, grass, etc. It lays from eight to 12 eggs, yellow-buff in color and marked with fine dots and spots of brown and very faint lilac lines.

**Cope, Edward Drinker** (1840-97), one of the most distinguished of American naturalists. He was of Quaker descent and was widely known in the field of comparative anatomy. For many years he was editor of the *American Naturalist* and professor in the University of Pennsylvania. He made extensive collections of the fossil vertebrates from the rocks of the western states, and filled his house in Philadelphia to overflowing with them. He prepared several monographs for the United States government. He was a voluminous writer, but most of his writings were technical. As examples of his many publications we mention only *Origin of the Fittest* and *Tertiary Vertebrates of North America* (1889). He died at Philadelphia on April 12, 1897.



E. D. COPE

**Co'penha'gen,** the capital of Denmark, is on the island of Zealand, with outlying parts on the island of Amager and the mainland. The city is defended by fortifications recently built and by old forts, especially by the citadel of Frederikshavn. The square, *Kongens Nytory*, is the center of the town's life. Its cathedral has a baptismal font by Thorwaldsen, and the Thorwaldsen museum has many of that sculptor's works. The royal castle, called Christiansborg, has a fine art-gallery, some of the pictures in which were burned in 1884. The university, founded in 1479, has 85 professors, 400 students and a library of 250,000 volumes; while the royal library has over 500,000 volumes. Copenhagen in the middle of the 12th century was a mere fishing-village. It was made the capital in 1443. The town has had three fires, and has been besieged and bombarded many times. It was in its fine harbor that Nelson, in 1801, destroyed the Danish fleet. The annual trade of the port amounts to about $120,000,000. Its industries embrace ship-building, distilling and brewing, sugar-refining, the manufacture of porcelain, soda, machinery and textile fabrics. Population, 462,161; or with its suburbs, 559,398.

**Copernicus** (*kō-pĕr'-nĭ-kŭs*), **Nicolaus,** the founder of modern astronomy, born at Thorn in Prussia, Feb. 19, 1473; died at Frauenburg, May 24, 1543. Previous to the time of Copernicus—or, roughly speaking, previous to the discovery of America—there existed among scholars a great variety of views regarding the structure of the solar system and regarding its relation to the fixed stars. The chief merit of Copernicus is that he first solved in a fairly satisfactory manner the great problem of the motion of the planets. If not the first to propose, he certainly was the first to work out, in detail, an explanation which is so simple as to command acceptance from everyone who clearly understands it. Instead of assuming, as the Egyptians and the Greeks and most people after them had done, that the earth is the center of the solar system, Copernicus assumed that the sun is the center, that the earth and the other planets revolve about the sun in circular orbits and that the earth rotates on its own axis. There are a number of details which Copernicus was unable to explain because he did not know that the orbits of the planets are elliptical, as was proved later by Kepler. Copernicus was educated at the University of Cracow, whither he went in 1491. Later he spent some years of study at Bologna and Padua, and at the latter place he took the degree of doctor of medicine in 1499. In 1503 he went to Frauenburg, where he practiced medicine and held several important offices in the church. The years from 1507 to 1530 were spent in the preparation of his immortal book: *The Revolutions of the Heavenly Bodies*, which, however, was not printed until after his death in 1543. The defense of the Copernican system was, therefore, left largely to his successors, principally among them to Giordano Bruno of Italy and to Galileo. The position of Copernicus in history may be more easily retained in memory, if the student will recall that he and Michael Angelo were contemporaries, there being only two years' difference in their ages. On the day that Michael Angelo died, Feb. 18, 1564, Galileo, the great defender of Copernicus, was born; while in the year that Galileo died, 1642, the illustrious Newton, who was to perfect and simplify the Copernican system, was born in England.

**Copley** (*kŏp'lĭ*), **John Singleton,** an American painter, was born at Boston, Mass., July 3, 1737. When only 16, his portraits were admired. Washington sat to him in

1755, and later, in London, he painted the king and queen (George III and his consort). Here, also, he became the friend of such men as West and Reynolds. Some of his best works are *Death of Lord Chatham*, *Death of Major Pierson*, *Charles I Demanding the Surrender of the Five Members* and the *Assassination of Buckingham*. His historical paintings are perhaps superior to those of West, and his portraits rank with those of Reynolds and Gainsborough. He died at London, Sept. 9, 1815.

**Cop'per.** This appears to have been the first metal used by man, both in war and in the peaceful arts. Like gold and silver, it is found native, sometimes in great masses, as on the south shore of Lake Superior, where blocks of many tons' weight have been obtained. The use of copper by ancient nations is well-known, through the many collections in museums of weapons and other objects of bronze, that is, copper mixed with a small quantity of tin. The ancients obtained most of their copper from Cyprus; hence the name. Copper has a fine red color, takes a brilliant polish, and is nine times heavier than water. Next to silver it is the best conductor of heat and electricity. It is moderately hard and highly tenacious, though not so strong as iron. The largest masses of native copper are found in the mines of Russia and in our own Lake Superior region. Copper is used in many ways. With other metals it makes brass, bronze and gun-metal; alone, it is used for boilers, cooking-vessels, pipes, wire, nails, spikes; in thin plates it is used for engraving and etching, and in strong rollers for calico-printing; as an electro-deposit it is used in copying engravings and pages of type for the printing-press. Copper is usually employed for lightning-conductors. Yellow metal, an alloy of copper, is used in sheathing the bottom of vessels. The United States is now the largest producer of copper. The richest mine in the world is at Calumet, Michigan, on Lake Superior. Arizona, Montana, Utah and other parts of the Union also produce copper. The world's production of copper, in 1906, was 715,268 tons, the chief countries producing the metal, besides the United States, being Chile, Japan, Mexico, Australasia, Spain, Portugal, Germany and South Africa.

**Copperfield, David,** published in 1850, is perhaps the greatest of the works that have come from the pen of Charles Dickens. This book gives a picture, on the one hand, of a charming candor and honesty and, on the other hand, of the misery and desolation that may be wrought by evil. In many ways *David Copperfield* is an account of the experience of Dickens himself, at least as regards his childhood and youth. The hardships, the loneliness, the uninviting tasks and even the debtor's prison were his own. John Dickens and Mrs. Dickens seem to have furnished him with models for the Micawbers; and their house in Gower Street, London, was too often the scene of real sieges by angry "duns." But the book itself has all the interest of a great novel. Readers of *David Copperfield* never utterly forget the impression of the happy home at Norfolk, the second marriage of David's mother and the difference which it makes for the child, the steady toil in the London warehouse, the loves of David with Dora and Agnes and the darker pictures of the betrayal of Emily and the villainy of Uriah Heep, whose schemes are in the end defeated by Micawber.

**Copperhead.** (*Ancistrodon Contortrix*) This venomous snake belongs to the rattlesnake family, but it has no rattle and gives no warning of its attack. Its head is the color of burnished copper, its body is brown or sometimes golden, with dark blotches, Y-shaped on the sides and round on the belly. It grows to over four feet in length, and is as venomous as any of our snakes. But the stories told of its ferocity in attack are probably untrue. It is sluggish, and the chief danger is lest, in picking up some object on the ground or in putting one's hand in the brush, one should touch it. In winter it sleeps in a ground-hole or den; from spring to autumn it seeks damp places, especially among rocky hills. In midsummer the young are born, alive. Its favorite food is field-mice. It is common among the hills that border the Hudson and Connecticut valleys; but it is also found from Massachusetts to Texas, though frequently called by such names as pilot, red-eye, red adder and copper-belly.

**Copts,** the Christian descendants of the old Egyptians. There were 609,511 of them in 1897, forming one twelfth of the population of Egypt. Most of them live in Cairo, but there are a number in Upper Egypt. They make good clerks and handicraftsmen. They are of middle height, with black eyes and curly hair. They dress like the Mohammedans; but can be told by their black or blue turbans. They are, as a rule, a morose people, but are the best educated and most intelligent of the native Egyptians. St. Mark is said to have made them Christians. The head of the church is the patriarch of Alexandria; they have bishops, monks and priests, the priests being allowed to marry before they take their vows; the patriarch does not marry, and when he sleeps he must be awakened every quarter of an hour. Wednesday and Friday are fast days, and the fast of Nineveh lasts nearly two months. The Coptic language goes back to the old Egyptian; the boys learn to read it at school, but Arabic is everywhere spoken. The United Presbyterians from the United

States have for 50 years had wonderful success with them.

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**Coquelin** (*kôk-lăn'*), **Benoit Constant,** a noted French comedian and, with his brother, also an actor, a writer on stage-art, was born in 1841 at Boulogne, and educated at the Paris Conservatoire. He first appeared at the Théâtre Français in 1860, and has met with great success in France, England and the United States in the representation of classic French comedy. His chief successes have been won in *Le Marriage de Figaro; La Malade Imagi*

M. COQUELIN

*naire; Fourberies de Scapin; Le Lion Amoureux*; and *Cyrano de Bergerac*. He died Jan. 27, 1909. His son, Jean (Coquelin *fils*), born in 1865; made his first appearance on the stage in 1890, and has, with great acceptance, filled many of his father's famous rôles.

**Coral,** the skeleton of sea-animals called polyps, constructed like the sea-anemone. The coral is formed within the fleshy part of the animals, without effort on their part, as bones grow in the body. Each polyp consists of a tubular body, fixed at one end. The other end is surmounted by a disc, in the center of which is a mouth, and the disc is surrounded by tentacles. The coral substance is carbonate of lime, and is laid down within the walls of the tubular body, and within membranous partitions reaching from the body-wall to the stomach-wall.

CORAL

It is formed in the lower part of the animal, leaving the upper part soft and flexible, and capable of being drawn in and expanded.

The coral-producing animals are sometimes solitary, but, more frequently, occur as colonies of many individuals, united together by a common branching stalk, so that the whole colony is shrub-like. Their general resemblance to plants is so great, that at one time they were called plant-animals. At intervals, along the trunk and branches of the shrub-like colony, are found the individual polyps. These are all connected by an expanse of living matter. The polyps take food from the water into the mouth-cavity, which leads at once into the tubular stomach, and the arrangement is such that the tubular canals of different individuals communicate, making it possible for the food to be carried from one part to another throughout the colony. Coral that is formed within a colony of this description is of the branching kind. (See illustration.) The limy substance is not only laid down in parts of the polyps, but in the expanse of living matter joining them together, and, therefore, the formation is continuous and assumes the general form of the colony. In the illustration the position of the polyps can be seen as small tubular elevations. There is great variety as to the size of different kinds of polyps. The illustration shows the common branching coral (*Madrepora*) of the Florida coast, in which the polyps are small. The colonies are not always of the branching form; some are in the shape of large rounded masses, with the polyps arranged in rows or furrows, as in the brain-coral and the star-coral. (See illustration.) These masses grow to be from one to three feet in diameter.

Besides living corals there are many fossil forms. Among the commonest are those stony masses, often called petrified honeycomb and petrified wasp's nests, to be found on beaches, in fields and imbedded in rocks. The honeycomb-shaped

CORAL

masses, especially, are polished and known locally as Mackinac stones. They are used as paper-weights and, to some extent, in jewelry. There also are chain-corals and the single horn-shaped corals.

Red coral is of a different kind. Although the colony which forms it is tree-like and the individual polyps have long tubular bodies, the coral substance is laid down in the base of the polyps—not in their body-walls—and, also, in the sheet-like expanse of living material that unites them. As a consequence, the product is smooth and not marked by elevations. The ordinary red coral used in necklaces and scarf-pins is not expensive, costing from one to one and a half dollars an ounce; but large pieces of the approved rose-tint, which are rare, bring several hundred dollars an ounce. In addition to the kinds mentioned, there are others, known as sea-fans, sea-plumes, etc. The stalk secreted is horny or limy, and, in the sea-fans, is a broad, thin expanse of reddish or yellowish material, formed into a fine network, with thickened veins running through it like the veins in a leaf. These are related to the red corals. The corals are one branch of a subkingdom of animals (*Cœlenterata*) that embraces jellyfish, hydroids and fresh-water hydra.

The extent of coral-formations in tropical seas is remarkable. These animals thrive only in warm (68° Fahr. and above), clear

water, and not below a hundred and twenty feet in depth. From that depth to the surface they live readily and form reefs. The great barrier reef (coral) of the northeastern coast of Australia stretches, with some interruptions, a thousand miles along the coast, and is in places from one to three miles wide and from twenty to sixty miles from the mainland. Some islands are entirely composed of coral-formations, and the everglades of Florida and the keys south of it are mainly coral-formations. There also are *atolls* or circular coral-reefs in mid-ocean, and, although their method of formation is now under dispute, the old explanation meets the requirement in some cases. It is supposed that they were originally built upon the sloping sides of a volcanic island and that, by very gradual sinking, the island disappeared below the water, leaving a central lagoon. The coral-animals, in the meantime, built toward the surface and kept pace with the subsidence. See Dana: *Corals and Coral Islands;* Darwin: *Structure of Coral Reefs;* Verrill in *American Naturalist,* Vol. II., p. 351.

**Corday, Charlotte.** See MARAT.

**Cor'dova** or **Cor'doba,** a city in Spain, on Guadalquivir River. Its old walls are surmounted by turrets, shut-in gardens, vineyards and narrow streets. Its cathedral was built as a Moorish mosque in the 8th century, and is the finest Mohammedan temple in Europe. Cordova was founded by the Romans in 132 B. C.; was captured by the Goths, and then by the Moors. From the 9th to the end of the 12th century it was one of the leading Moorish cities, famed for its mosque, palaces and great university. Cordova is also a province of Spain, with an area of 5,299 square miles and a population of 455,859. Its chief product is coal. Population of the town, (1900) 58,275.

**Coréa.** See KORÉA.

**Corelli, Marie,** a notable and prolific English novelist, the adopted daughter of the Scottish song-writer, the late Charles Mackay, was born of Italian parents and educated partly in England and partly in a convent in France. She was designed at first for a musical career; but early in the eighties she abandoned this for literature, making a marked success as a writer of fiction. It is said that a curious psychical experience, occurring to herself personally, suggested the theme of her first novel, which appeared in 1886,—*A Romance of Two Worlds.* This work, together with her novels, *Barabbas* and *The Mighty Atom,* met with a phenomenal sale, and all have been translated into most of the languages of Europe, as well as into Persian and Hindustani. Hardly less successful have been her other stories: *The Sorrows of Satan; The Soul of Lilith; Thelma; Wormwood; Ardath; The Murder of Delicia; The Master Christian;* and *Temporal Power.*

**Corfu** (*kŏr-fōō'*), the largest of the Ionian Islands, the possession of Greece, lies at the entrance of the Adriatic Sea. It is 40 miles long and two and a half wide. The island is mountainous, the highest point being Pantocrator, 2,997 feet above the sea. The main export is olive-oil. Corfu was first named Corcyra, and was a colony of Corinth. It became so powerful that it fought with the mother-country the first sea-battle of which we know, in 665 B. C. Area 431 square miles; population (1896), 124,578. Population of the town of Corfu, 17,918.

**Cor'inth,** called the Star of Greece, lies on the Isthmus of Corinth, under the northern slope of the mountain, forming one of the strongest fortifications in the world, on which stood its citadel. With Argolis, Corinth forms a portion of the kingdom of Hellas, adjoining the isthmus that connects the Peloponnesus with Attica and the mainland. Its area is 1,442 square miles and the population of the province is about 170,000. The city has three harbors, and its position midway between the Ægean and Adriatic Seas made it a trade center. It was much easier to carry goods across the narrow isthmus than to sail around the Peloponnesus, and so in its western harbor lay ships from Italy, Sicily and Spain, while its two eastern harbors trafficked in the merchandise of Egypt, Syria, Phrygia and even India. Corinth itself exported chiefly statues, pictures, vases and bronze and earthenware vessels. Corinth built the first triremes or galleys, which, rowed by its numberless slaves, sailed everywhere, founding a dozen or more great colonies of the mother-country, the largest being Syracuse. We are told that Corinth was founded in 1350 B. C. by Sisyphus, an Æolian. Later, it was conquered by the Dorians. Sometimes it was under a king; at others under an oligarchy or the rule of the few. Its foremost king was Periander, who fostered the city's growth; the greatest patriot was Timoleon, whose love of his native city made him overthrow and slay his own brother, the tyrant, Timophanes, who had made himself master of Corinth. Corinth was the first city to become jealous of the rising power of Athens after the Persian War, and incited the other states to begin the great Peloponnesian War. Later, it waged the Corinthian War with Athens, Thebes and Argos against Sparta. Here Alexander was named the leader of the Greeks against Persia. In 146 B. C. the Romans razed Corinth to the ground. Just a hundred years later Julius Cæsar rebuilt it, and it soon became again a great trading-center. St. Paul lived here a year and a half, founded a Christian church and afterward wrote to the Corinthians two of his letters. Here also were held the famous

Isthmian games. The gods of the sea and of love especially were worshiped; it was the most vicious city of Greece, noted for its luxury and art. Later, Corinth was overrun by Alaric, the Slavs, Franks, Turks, Venetians and Turks again. When freed from the sultan in 1822, it had a steady growth until 1858, when it was devastated by an earthquake. It has since been rebuilt, three miles northeast of the old site and near the western mouth of the canal that has been cut through the isthmus. The population of Corinth at the height of its fame was about 300,000; population of the commune (Gortho) to-day is about 12,000.

**Corinth,** a town in Alcorn County, Miss. It is a railroad-junction, and so was of great importance during the Civil War. On Oct. 3, 1862, it was held by a Union force of 53,000 under General Rosecrans, and firmly intrenched. The Confederates, 40,000 strong, under Generals Price and Van Dorn, tried to carry the works by storm, but were repulsed and pursued with heavy loss. The Federal loss was 2,502; that of the Confederates, 3,117. The population of Corinth according to the last census, is 5,020.

**Corinth, Gulf of.** See LEPANTO.

**Coriolanus** (*kō-rĭ-ō-lā'nŭs*), **Gaius Marcius,** so called from his bravery at the taking of Corioli, a Volscian town, in 493 B. C. He was a Roman patrician, and so opposed the plebeians or common people. The people refused to choose him consul, and in return he made a speech in the senate against a free distribution of wheat to the citizens, which had just come from Sicily. Thereupon he was banished; but soon, at the head of the powerful Volscians, he won victory after victory, and now swooped down upon Rome. In vain did the leading men go to his camp to dissuade him from attacking the city. At last the noblest women of Rome, headed by Coriolanus's aged mother and his wife leading his two sons, came to his tent. His wish for vengeance could not withstand their tears, and he led the Volscians back to their own country. Shakespeare founded his *Coriolanus* on this story, as related in North's *Plutarch.*

**Cork,** a tissue usually formed in the outer part of the cortex of perennial plants. The tissue is characterized by the fact that the cells are flat, with no spaces between them, and the walls are water-proof. Cork is the most prominent part of bark, and the commercial supply is obtained from the bark of a species of oak, *Quercus Ilex* (often called *Q. suber*). Forests of cork-oak are cultivated in southwestern Europe.

**Cork** (meaning swamp), a city of Ireland, is situated on the River Lee, in a pretty valley, built partly on a group of little islands, joined by nine bridges to the rest of the town, which is built on the river-banks. Its race-course park and Mardyke, a shaded walk a mile long, are its chief features. The cathedral, St. Ann de Shandon's church and Queen's College, founded in 1849, are the main buildings. The city owes its growth to the facilities afforded by Cork harbor, a basin ten miles square. It is guarded by batteries, with three forts fitted with the heaviest guns. On the banks of the Lee are also four miles of wharves. Cork is a busy manufacturing and exporting city. Its port is Queenstown. In 600 an abbey was erected on its site, and the Danes built its walls in the 9th century. It was surrendered by its last king Dermod MacCarthy, to Henry II in 1172. Cork also is a county in the province of Munster, area 2,890 square miles. Population, 391,090. Population (1911) of the city, 76,632.

**Corm,** a special form of thickened underground stem which resembles a bulb in outline, but has thin scale-leaves upon it, instead of fleshy ones. Indian turnip (from Jack-in-the-pulpit) is a typical corm.

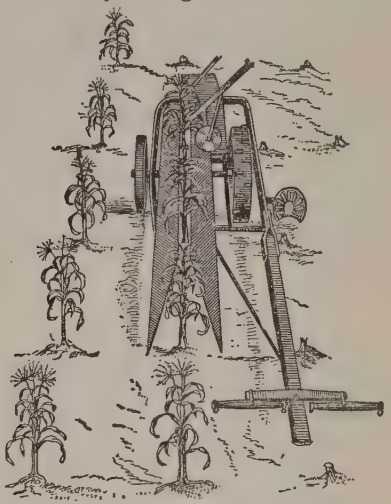
**Cormorant,** a web-footed bird related to the pelican, that feeds like a glutton on fish, which it catches by swimming and diving. It has a strong, hooked bill, long neck, short wings and a rather long round tail. Its plumage is blackish, but the face is usually naked and brightly colored. It is very widely distributed; some forms live inland by rivers and lakes, others on the seacoast and about islands. Some of the cormorants of the United States live in pairs, but more often in great flocks, flying around vessels at sea in great numbers. They are also called shags. The Chinese breed and train them for fishing. A ring of hemp is tied around the neck to prevent them from swallowing the fish, and, for two or three hours at a time, they will dive and bring up fish in their bills, which are taken into the boat by the fishermen. Fish too large to be managed by one are attacked by two or three birds at a time. In 1898 a very large non-flying cormorant was discovered on one of the Galapagos Islands. The bird is rare.

CORMORANT

**Corn, Indian,** or **Maize,** the original name of corn or *Zea Mays*, a species of the grass family. Corn is said to have become the most important food-plant, next to rice. It is now almost unanimously conceded that it originated in America and is probably native to Mexico. Corn was found in cultivation by the Indians upon the discovery of America, and has continued to be called Indian corn; in fact the name maize is seldom used in America. Although very numerous varieties have been developed, they are all considered to have been derived from a single species. The commonly used classification is as follows: pod-corns, pop-corns, flint-corns, dent-corns, soft-corns, sweet or sugar-corns, starchy sweet-corns. Sweet corn is distinguished from the ordinary field-varieties by its wrinkled or shiveled kernel and its somewhat translucent appearance. The pop-corn is characterized by the excessive development of the horny region of the endosperm and by the very small size of the kernels and ears. Corn is hardly less a staple food than is rice in tropical countries, while in colder countries it is rapidly becoming popular. It is thought to be more nutritious than barley, buckwheat or rye. It is more generally used in America than in other continents. In the United States the annual crop is over 2,700,000,000 bushels, or about two thirds of all the grains grown. When coarsely ground, corn forms hominy; when finely ground, corn-meal. Pop-corn is a variety whose grains, when roasted, swell and burst, turning inside out. However, the greatest use of corn in America, is as a food for cattle, sheep and hogs. Large quantities of starch are made from corn. This is used for food and for laundry-work, while a good part of it is made into grape-sugar or glucose. The dried leaves and stalks of corn furnish a supply of cattle-fodder. The husks are used for packing and for mattresses; while in South America they are also used for cigarettes. The cobs make popular pipe-bowls for tobacco. Corn was introduced into Europe by Columbus; but there is good ground for believing that the maize plant was known in Asia and Africa before that time.

CORN

**Corn-Harvester.** Among the many labor-saving machines which have so greatly aided modern agriculture is that known as the corn-harvester. One type of these machines cuts the corn and binds the stalks in bundles ready for shocking. Another type cuts and shocks the corn without binding it into bundles. With the use of one of these machines a single man with a team may easily cut eight or ten acres of corn in a day, doing the work of four to



CUTTING MECHANISM OF CORN-HARVESTER

eight men by former hand-methods. The illustration shows the cutting mechanism of one of these machines. The edges of the side-knives are at an angle to the line of draft, and as the machine advances the knives move with a shear-cut against the corn-stalks, severing them. They are then carried away by a conveyor and bound in bundles.

**Corneille** (*kôr'nāl'*), **Pierre,** the greatest French tragedian and the founder of French comedy, was born at Rouen, June 6, 1606. His ill-success as a lawyer sent him to Paris in 1629, where his first comedy was produced and acted in two theaters at the same time. In 1636 *The Cid*, his most popular tragedy, took Paris by storm, and in spite of Richelieu, a personal enemy of the author, and in spite also of the Academy, his creature, could not be suppressed; and soon "fine as the Cid" became a common saying. *Le Menteur* showed the author to be great in comedy as well as in tragedy. *Polyeucte* and *Rodogune* are others of his best works; while the finest verses he wrote occur in the central love-scene of *Psyche*. *Horace* and *Cinna* are also favorite productions of Corneille. Strength and sublimity are his chief characteristics.

**Corne'lia.** See GRACCHI.

**Corne'lius, Peter von,** one of the first masters of the modern German school of painting, was born at Düsseldorf, Sept. 23, 1783. When but 19 years old, he

painted some fine frescoes in an old church. In Munich he painted his greatest works—a series of frescoes based on the stories of the Greek gods and heroes, and another series of New Testament scenes from the Incarnation to the Judgment, the latter being the largest fresco in the world. He achieved fame also by his *Four Riders of the Apocalypse*, painted in Berlin. More important than his paintings, perhaps, was the impetus he gave to wall-decoration. He died at Berlin March 6, 1867.

**Cornell, Ezra,** American philanthropist and founder of Cornell University, was born at Westchester Landing, N. Y., Jan. 11, 1807, and died at Ithaca, N. Y., Dec. 9, 1874. He settled in Ithaca as a mechanic and miller in 1828, and early took an active part in the construction of telegraph lines, in which, and in connection with the Western Union Telegraph Co., of which he was the founder, he amassed a fortune. Early in the sixties he was a member of the state assembly, and later was elected to the state senate. In 1865 he gave half a million dollars, afterward much augmented, to found the university at Ithaca, N. Y., which bears his name, and to which Congress made an appropriation of land. The institution opened in 1868.

**Cornell University,** is located on Cayuga Lake, at Ithaca, N. Y. It was chartered in 1865 and 1867, and with ample endowment, including the income from a grant of nearly a million acres of land, it rapidly took rank with the first educational institutions of the country. It was named after Ezra Cornell, who gave a large sum toward its endowment, and whose able management was largely instrumental in placing the institution on a sound financial basis. Besides the academic department it has Colleges of Law, Medicine, Agriculture, Veterinary Medicine, Architecture, Civil and Mechanical Engineering. The teachers number 750, and the students 6,891.

**Cor'net,** a musical instrument, usually of brass and originally curved like a horn. The best form is known as the cornet-à-pistons, because changes of sound are made by manipulating pistons with the fingers. It has a compass of two octaves and two notes. It is not an instrument of especially fine or delicate sound; but in orchestras, in company with other instruments, its effect is excellent.

**Corn'ing,** N. Y., a growing town in western central New York, one of the capitals of Steuben County, 17 miles west of Elmira. It is situated on the Chemung River, and has a number of factories, including railroad-car-shops, brick and terra-cotta works. The leading industry, glassware manufacture, employs upwards of 2,000 people. It has good educational facilities and an active civic life. It has the service of three railroads. Population, 14,666.

**Corn'planter,** a half-breed Seneca Indian and chief of the Six Nations. He was born about 1732, and was the son of John Abeel, a white trader. He fought the English at Braddock's defeat, and was a deadly foe to the colonists during the Revolutionary War; but afterward became a steady friend of the white people. He was an intelligent, dignified and moral man. He died on Feb. 18, 1836. Pennsylvania erected a monument in his honor in 1867.

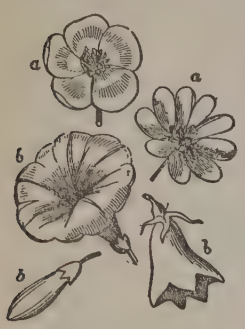
**Cornu** (*kôr'nü'*), **Marie-Alfred,** a distinguished French physicist, lately occupying the chair of physics at the *École Polytechnique*, the great military school of Paris. He was born on March 6, 1841, and was educated at the institution where he later taught. Cornu's investigations cover a large range of optical and acoustical subjects. Among the most important of these may be mentioned his very accurate determination of the speed of light by the method of Fizeau; his determination of the density of the earth by the Cavendish method; his study of the solar spectrum and the ultra-violet spectra of the metals; and his mathematical discussion of the diffraction-grating. Besides being a member of many learned societies, Cornu was a prominent member of the French Academy, and was president of the International Congress of Physicists which met at Paris in 1900. He died in 1902.

**Cornwall Canal.** This Canadian canal extends past the Long Sault rapids from Cornwall to Dickinson's Landing. From the head of the Soulanges to the foot of the Cornwall Canal there is a stretch through Lake St. Francis of $32\frac{3}{4}$ miles, which is being made navigable for vessels drawing 14 feet. The length of the canal is eleven miles. It has six locks 270 by 45 feet. The total rise or lockage is 48 feet. The depth of water on the sill is 14 feet. It is 100 feet wide at the bottom and 164 at water surface. See LACHINE and SOULANGES.

**Cornwall,** county-seat of Dundas, Stormont and Glengarry Counties, Ont., is situated on the north bank of the St. Lawrence River at the foot of the Long Sault rapids, and has a population of 6,704 people, largely engaged in manufacturing. It is on the Grand Trunk and Ottawa & New York railways. Its leading industries are cotton, woolens, paper, machinery and pottery.

**Corn'wallis, Charles, Marquis,** was born at London, Dec. 31, 1738. He served in the Seven Years' War, and accepted an appointment as major-general in America, though he disliked forcing taxes on the colonists. He was the ablest British general in command, winning the battle of Camden against General Gates, gaining a slight advantage over Greene at Guilford, but being forced to surrender at Yorktown

in 1781. He afterward was governor-general of India, where, by his victories over Tippoo Sahib, he probably saved India to the English Made lord-lieutenant of Ireland, he put down the rebellion of 1798, and gained the good-will of the Irish. The ability of Cornwallis in India and in Ireland shows that his failure in America was largely due to the poor generalship of his superior officers, Howe and Clinton. Cornwallis died on Oct. 5, 1805, while on his way to the Indian upper provinces, having been made governor-general a second time.



a, a. Corollas with free petals.
b, b. Corollas with petals united.

**Corol'la** (in plants), the inner set of the two floral envelopes, which usually forms the showy part of the flower. The individual parts are called petals. See FLOWER.

**Coronado** (*dā kō'rō nā'thō*), **Francisco de,** a Spaniard, born in Salamanca probably about A. D. 1510, was the leader of a pioneer force of troops which, starting from Mexico, did much to explore the unknown region which now is the southwest portion of the United States. The expedition appears to have advanced as far as what now is Kansas. Coronado saw the possibilities of the land which he visited for agriculture; but he was disappointed in his search for precious metals. His papers give the first reliable account of the American bison or buffalo. The latter part of the life of Coronado was spent in retirement, and the date of his death is uncertain. For the papers of this expedition see *The Coronado Expedition* (Winship) in *Reports of the U. S. Bureau of Ethnology, No* 14.

**Corot** (*kō'rō'*), **Jean Baptiste Camille,** a French landscape-painter, was born at Paris, July 28, 1796. He was first a clerk in a dry-goods store, but his tastes led him early to study art. His paintings made their way slowly, but wealth and fame finally came to him. Corot's landscapes were true copies of nature. His favorite subjects were misty lakes, rivers smothered in vapor and the quiet of moonlight or sunrise, which he painted as a poet would have written of them. He had great influence on young French artists, who admired and liked him for his genius, kindliness and generosity. At one time they gave him a medal of their own when the Salon had passed him by, and they always called him Father Corot. Among his masterpieces are *The Dance of Nymphs* and *Macbeth.* He died on Feb. 22, 1875.

**Corporations.** Corporations were known to the laws of ancient Rome; but it is only of late, and especially in the United States, that their value as an instrument of commerce as well as their danger to the public welfare has been fully realized. We seem to be in a fair way to preserve the use and to prevent the great abuse of corporate power. A corporation is distinguished from the ordinary partnership in that it is, in the eyes of the law, a distinct *person,* created by the act of incorporation. It continues, though all the original shareholders have died, its acts are to be considered quite distinct from those of the shareholders, it may sue or be sued in the courts. In one sense it is even a citizen, for it has in general the privileges guaranteed by the constitution of appealing to the supreme court against any state action which the constitution forbids. But this citizenship it does not possess in one matter. It cannot claim the right to do business in any state under the same conditions as those that govern citizens of that state. Thus Texas may pass one set of laws for corporations incorporated within its limits, and another for all other corporations, and forbid their entrance to the state on any other conditions. However, by the interstate commerce provision of the constitution, the products of a corporation of another state may not be excluded from any state, except under conditions that apply to all persons alike. A partnership, on the contrary, is not a distinct person, and the several members are liable to suit for the actions of their partners in whatever business they have agreed to be partners. A joint-stock company, in like manner, is not a separate person, and the members are liable to be sued for its acts, though they are not held to be responsible for all the acts of the company's officers as a partner is responsible for his partner's acts.

At present the Federal government does not incorporate; that is left to the several states. In some states every corporation must be established by a special act of the legislature; but it is now common to lay down by statute the conditions of incorporation and then, whenever those conditions have been fulfilled, the corporation is by that fact established. The act of incorporation has been held by the supreme court to be a contract between the state and the corporation, and it cannot therefore be broken. The state must therefore arrange for the control that it desires to exercise over corporations before the corporation comes into existence. It is here that we have failed. New Jersey, above all other states, offered exceptionally favorable terms to corporations if they would incorporate under her laws, so as to give her the benefit of the taxes

that might be imposed on them. New York was compelled to follow suit, in part, for the same purpose. Other states have joined in this attempt to offer favorable terms with the result that proper provisions for control have not been inserted. The failure to insert proper provisions when incorporating many of the railroads has been especially injurious. It is largely as a result of these mistakes of the state governments, and also because of their inability to agree upon a single line of action toward corporations, that the Federal government has been obliged to take action in the matter. Practically all great trading corporations deal in interstate commerce, and Congress has control over such commerce and thus, indirectly, over such corporations. It has been *proposed* that all corporations that have interstate commerce be required to receive incorporation from the Federal government.

Corporations may be divided into sole and aggregate. A sole corporation exists where, for example, the Secretary of War in England *with his successors* is a corporation. Most corporations have many members and are *aggregate*. These are divided into public and private corporations, of which the former include, for example, cities and villages, which are conducted by the public for the public good. There also are eleemosynary corporations which are run by *private* individuals for the public good, as colleges, churches. The savings-banks in like manner are eleemosynary.

**Corpus Christi, Texas,** a city and county-seat of Nueces County, 149 miles from San Antonio. It is located at the mouth of the Nueces River, on Nueces and Corpus Christi Bays. It is the trading-center of a fine agricultural and stock-raising region, and its fish-packing business is very large. The city has good public schools, a convent, several churches, etc. It is served by four railroads, and has a regular freight steamer service with New Orleans. Population at the present time is 20,000.

**Correggio** (*kŏr-rĕd'jō*), **Antonio Allegri da,** was named from his birthplace, Correggio, near Modena, Italy. He was born in 1494, and, as his father was well-off and his uncle an artist, Antonio seems to have had none of those struggles with poverty that have hampered so many painters. In 1518 he painted a salon in the convent of San Paolo in Parma. The groups of goddesses, graces and nymphs were painted with a fullness of life, gaiety and grace, at that time unknown, that at once stamped him as a genius. In 1522 he began his famous decoration of Parma's cathedral, painting in the main dome his *Assumption of the Virgin*—the Madonna borne up to heaven by a countless throng of rejoicing angels, while the Savior descends to meet her. This is deemed the painter's masterpiece, and Titian, when he first saw it, said: "If I were not Titian, I would be Correggio." *The Night, Il Giorno* and *The Reading Magdalene* are among his best-known pictures. In Correggio's art there are a wonderful gaiety and a sunny charm; he was a master of light and shadow; and hardly any artist equaled him in painting human flesh. He died on March 5, 1534.

ARCHBISHOP CORRIGAN

**Cor'rigan, Michael Augustine,** Roman Catholic archbishop of New York, was born at Newark, N. J., Aug. 13, 1839, and educated at St. Mary's College, Wilmington, Del. In 1863 he was ordained to the priesthood at Rome, and, after holding the chair of dogmatic theology and subsequently the presidency in Seton Hall College, Orange, N. J., he was appointed by Pope Pius IX to the see of Newark in 1873. Seven years later he became coadjutor to Cardinal McCloskey, and, on the death of the latter, was made metropolitan of the diocese of New York in 1885. He died on May 5th, 1902.

**Correlation of Studies.** In modern methods of teaching the attempt is made to relate together those portions of the subject-matter of the curriculum which appeal to the same human interest. Thus it is evidently better, other things being equal, to teach the history and geography of a country in close connection with each other, rather than independently. The principle of relating portions of the curriculum to each other or to a common interest is called the correlation of studies. Correlation is one of the practical recommendations of the school of Herbart. Froebel also related the activities of the child as far as possible to a central object; but correlation is not the same conception for Froebel as for Herbart. For Herbart, correlation is based upon a theory of association of ideas in the individual mind. For, in order that the life of thought may possess unity and harmony, it seemed to Herbart that ideas should be associated according to a process to be directed by the teacher from without. In other words, instruction needs to be a deliberate endeavor to organize the pupil's ideas, and not merely to present them to him; since otherwise the house of thought and, hence, of will might be so divided against itself that it could not stand. But to Froebel, correlation appears to indicate just the recognition of the fundamental oneness of the individual with society. Correlation

is for him the process of carrying over the inward unity of the self to the field of its manifestation or liberation. According to this view, which has been expounded by Professor Dewey, the correlation of studies is not so much a process of relating them to each other as of relating them to life and to its needs and purposes. The child or the student will correlate subjects for himself. This, however, is no reason why the teacher should not assist him in so doing, as Herbart advised. The child will correlate his manual training with his geography more readily, if the teacher shows him on the map from what countries and by what routes the various species of woods which he uses are brought.

Special types of correlation are those known as *concentration*, in which the attempt is made to relate all the curriculum to one topic, and *co-ordination*, in which the subjects of the curriculum are arranged in several groups. As an example of the first type Ziller would make all the instruction of a pupil for one year to be grouped about the story of Robinson Crusoe. As an example of the second type Dr. Harris would subdivide the curriculum into five groups of equal value, so that the subjects in each group should be closely interrelated.

See *Report of Committee of Fifteen* of National Educational Association; also books of the Herbart Society.

**Correspondence-Schools.** The first regularly organized correspondence-courses appear to have been given by the Chautauqua Circles about 1880. Since that time this means of education has been adopted to a considerable extent by a number of colleges and universities, and by receiving credit for work thus done, many worthy students are enabled to earn university degrees who would otherwise be unable to do so. The University of Chicago offers a very large number and variety of correspondence-courses.

The greatest development of this method of instruction has been in the hands of private schools devoting their whole attention to the work. They send out instruction-papers especially designed for home-instruction. They require written answers to questions upon the work as soon as it has been mastered by the student, and these answers are sent to the instructor, corrected by him, and returned to the student. The instruction in most cases is satisfactory. It cannot be denied, however, that the successful pursuit of this method of study requires more than average perseverance on the part of the student. Many give up their courses before they are completed. It seems advisable in most cases to have the work divided into courses which can be completed in a comparatively short time and to require a course to be finished within a specified time, in order to furnish a stimulus to regular systematic work.

Some of the schools have advertised largely and gathered in students' fees, which were incompetent to give in return anything more than nominal service. Students intending to enroll in correspondence-courses should be on their guard against inferior or fraudulent schools of this kind. See CONTINUATION-SCHOOLS.

**Corsica** (*kôr'sĭ-kà*), an island and department of France in the Mediterranean, lying due south of Genoa and separated from Sardinia by the Strait of Bonifacio. Corsica (Corse in French, from the Greek *Cyrnus*) was the birthplace of Napoleon Bonaparte. Its surface is mountainous, and the island was long noted for its vendettas and brigands. Its products besides timber, include oranges, lemons and grapes,—the chief exports being wine and olive-oil. It has an area of 3,367 square miles; its length is 114 miles, and its breadth 52 miles. The capital is Ajaccio on the west coast; but the chief town is Bastia on the northeast portion of the island. The population, which speaks Italian mainly, is about 295,589. The island was acquired by the Romans at the close of the first Punic War, and was for periods held by Vandals, Goths, Franks, Saracens, Pisans and Genoese. France acquired it in 1768, but in 1793 it came for awhile under British rule; though three years later it was regained by France, which today maintains a torpedo-station on the island.

**Cor'sica'na, Texas.,** the county seat of Navarro County, on St. Louis Southwestern, Trinity & Brazos Valley and Houston & Texas Central Railroads, 50 miles south-southeast of Dallas and 162 miles northeast of Austin. It has an Odd Fellows widows and orphans' home and a state orphan-asylum. Among its industries, besides planing, flour cotton and cottonseed-oil mills, are foundry and machine-shops, brick-yards and a grain-elevator. Population, 15,240.

**Cortelyou, George Bruce.** Born July 26, 1862, in New York; was educated in the schools of Hempstead, L. I. and in the Institute and state Normal School, Westfield, Mass. He was a law-reporter in New York City for a time, and from 1885 to 1889 he taught school in that city. He entered public service as a private secretary in 1889, and in 1895 was appointed stenographer to President Cleveland. He acted as private secretary to President McKinley and President Roosevelt; and, when the Department of Commerce and Labor was organized in 1903, he was appointed secretary of that department. In 1905 he became Postmaster-General, and in 1907 he was appointed Secretary of the Treasury. During the presidential campaign of 1904

Mr. Cortelyou was chairman of the Republican National Committee.

**Cortes** (*kôr'tēz*), **Hernando,** the conqueror of Mexico, was born in Medellin, Spain, in 1485. At 19 his longing for adventure sent him on a voyage to San Domingo, and soon after he joined Velasquez in the conquest of Cuba. Alvarado's glowing description of Mexico induced Velasquez to place Cortés at the head of a new expedition. On Nov. 18, 1518, Cortés sailed on one of the most daring adventures of history. He had 550 Spaniards, two or three hundred Indians, twelve or fifteen horses, ten brass guns and a few small cannon. At Trinidad he was astounded by orders from Velasquez to give up the command. Cortés refused to do this, and so cut himself from all hope, save in success. Landing, he fought his first battle at Tobasco, where he captured the beautiful and faithful Donna Marina, who became his interpreter. Soon messengers came from the king, Moctezuma, bringing rich presents but forbidding him to visit the capital. Here some of his men, who were friendly to Velasquez, wanted to turn back, but, taking them into his confidence, the commander told them that conquest, not mere trade, was what he was after, and so won them over. Founding Vera Cruz and burning his ships behind him, he marched to Tlascala, and after hard fighting subdued the country. Soon after, with some thousands of Tlascalans, now his allies, he set set out for Mexico. On Nov. 8, 1519, Cortés reached the capital, which seemed to the Spaniards like a dream or an enchanted castle. They saw before them a city of 300,000 people, in the middle of a great salt lake, approached by three causeways of solid masonry, from three to six miles long, with many wooden drawbridges. He had hardly been a week in the city, when, on the ground that Vera Cruz had been attacked, Moctezuma was carried to the Spanish quarters and put in irons. At first the Mexicans were stricken with fear of these strange men, with horses and cannon; but they soon saw that they were only men after all, and very few at that; so when Moctezuma had been imprisoned some five months, he begged the Spaniards to leave. Cortés asked for time, and learning that 18 ships had landed, sent by Velasquez, he left Alvarado in command, and with a handful of men set out for the coast. At Cholula, by a night-attack in a blinding storm, he defeated 800 fresh Spaniards, who gladly joined his troops. Two weeks later came the news that the Spanish quarter was besieged. On reaching the city, Cortés found himself face to face with the whole nation, led by Moctezuma's brother. After driving back with difficulty a fierce attack, he saw that he must leave the city. At midnight began the retreat over the causeway. Its three bridges had been destroyed by the Mexicans; the first was crossed by a pontoon, but at once the lake was covered with canoes, and so hot was the attack that at the second bridge the pontoon could not be raised. Soon the water was choked with struggling horses and men, and the retreat became a hopeless rout. Out of that fearful night a handful escaped to land, only to find themselves surrounded by a countless host. Yet they cut their way through, every man fighting as ten men would fight, and reached their friends, the Tlascalans. Six months later Cortés, with 10,000 Tlascalans, marched on Mexico again. Brigantines were built, attacks along the causeway were made and a regular siege begun; 50,000 Mexicans died from famine and pestilence; yet the city had to be destroyed before it was taken. At last it fell, after 75 days' siege, which for bravery ranks with any in the annals of war. The Spaniards entered, but found only ruined houses filled with heaps of dead. In 1528 Cortés visited Spain and was highly honored, but, though appointed captain-general, he was not made governor of New Spain, as Mexico was now called. The next ten years he was forced to stand by and see another's bungling government of the rich empire he had won. Meanwhile he discovered Lower California (1533). Disappointed, poor and in ill-health, he went back to Spain in 1540. He accompanied Charles V on his disastrous Algerian expedition, and, touched to the heart by the emperor's refusal to allow him to capture Algiers, answered: "I am a man who has given you more provinces than your ancestors left you cities." Cortés was no common adventurer, but a captain of great military genius and, withal, a statesman of deep foresight. He was cruel sometimes, and passionate, but patient, religious, simple in life, and worshiped by his soldiers and Indian allies. He died near Seville, Dec. 2, 1547.

**Cor'tex** (in plants). The tissues of stems and roots are arranged in three general regions. In the center is the woody cylinder, sometimes solid and sometimes containing a pith. Outside of the woody cylinder is the region of the cortex, containing the active cells; and about the cortex is the epidermis. In perennial plants, where bark is formed, the cork is developed in the cortex, and the epidermis disappears.

**Cort'land, N. Y.,** a city, the county seat of Cortland County, on the Delaware, Lackawanna & Western and Lehigh Valley railroads, 35 miles south of Syracuse. Settled in the latter part of the 18th century, the city was in 1829 set off as Cortlandville. It has a state normal school and other educational institutions, together with the Hatch Public Library. Its manufactures

embrace carriage and wagon-shops, door and window-screen factories, besides wire and wire-cloth, wall-paper, drop-forgings and carriage-trimmings establishments. It is a shipping point also for agricultural and dairy produce. Population, 12,259.

**Cor'win, Thomas,** was born in Bourbon Co., Ky. in 1794, but was brought up in Ohio. He became a lawyer, and was noted both as a speaker at the bar and for his keenness in sifting and massing evidence. He was chosen state representative, member of Congress and later, senator, acting with the Whigs. He was opposed to the Mexican War as unjust. He was elected governor of Ohio after a thorough canvass, speaking in every county and delivering a brilliant speech in support of General Harrison, then Whig candidate for president. In 1850 he became secretary of the treasury under Fillmore. A member of Congress again, in 1858, and supporter of Lincoln in 1860, he was in favor of a compromise on the slavery question, which, he hoped, would avoid war. He became minister to Mexico in 1861, and died at Washington, D. C., Dec. 18, 1865.

THOMAS CORWIN

**Corymb** (*kŏr'ĭmb*), a flat-topped flower cluster, in which the pedicels of the flowers are of different lengths, arising from the axis at different levels. The outer flowers bloom first. See INFLORESCENCE.

**Coshoc'ton, Ohio,** a city, the seat of Coshocton County, on the Muskingum River and on the Pittsburg, Cincinnati, Chicago & St. Louis and Wheeling & Lake Erie railways, about 70 miles east-northeast of Columbus. It was settled early in the last century and incorporated in 1833. Its manufactures include novelty-advertising establishments, wooden-novelty works, machine-shops, glass-factory and other "plants." It has a public library, churches and schools, and owns its own water-works. Population, 9,603.

**Cos'sacks,** a race first known in the 10th century in the region south of Poland and Muscovy. Their name has been said to mean an armed man, a coat, a saber, a goat, etc. Their race-stock is just as uncertain; probably they sprang from mixed Slavonic, Tartar and Circassian tribes, though some hold them to be Tartars, and others almost purely Russians. They fought against the Turks and Tartars, and were very powerful in the 15th century. Poland and Muscovy employed them to guard their boundaries; while Cossacks are to be met with in the outposts of Russia in Siberia, Central Asia and the Caucasus. Sometimes living near hostile peoples, they formed a cordon of settlements along the borders of territory they held; sometimes living in the midst of enemies, they gathered in separate camps, ever ready for attack or defense. They are a democratic people, choosing all their officers for one year only. Every Cossack, too, might be elected to any post, even the highest, that of hetman. There were two branches: the Little Russian and the Don Cossacks. Descendants of the Don Cossacks now form part of the cavalry of the Russian army, and stand fatigue, hunger, thirst and cold with the greatest patience. Though for a long time thought to be fierce savages, late travelers say that in ability, cleanliness and enterprise they are above the average Russians, and in the 18th century an Englishman who had lived with them affirmed that they were "a civilized and very gallant as well as sober people."

**Costa Rica** (*kos'tà rē'kà*) (meaning rich coast), a republic of Central America, reaching from the Atlantic to the Pacific, with Nicaragua on the north and Panama on the south. It has an area of 18,400 square miles. Aside from the few Indians, the people are sprung from the Spanish settlers. The country is rich in gold, silver and copper, but its chief trade is in coffee, bananas and bar-gold, and it has been called the Coffee Republic. Costa Rica was discovered by Columbus, and a settlement was founded, probably in 1502, on his fourth voyage. It became free from Spain in 1821, and has had several constitutions, with a president and congress chosen every four years. It is held to be the best governed republic in Central America, though it is in default in meeting the principal and interest of its public debt. Costa Rica has an army of 1,000 men (infantry and artillery) besides 5,000 militia; though on a war-footing the republic can command about 150,000 militia. The state also has one gunboat and one torpedo-boat. In 1909 the value of its exports was $8,176,257; while its imports amounted to $6,109,938. There are 75 post-offices. The railways extend about 300 miles. The bulk of the trade is with the United States the latter supplying Costa Rica with breadstuffs and ironwork. The state-church is Roman Catholic. The capital is San José (population, 26,682). The other chief towns are Cartago, Alajuela, Limon, Puntarenas and Heredia. Population, 351,176 and about 3,500 aborigines.

**Cotes, Mrs. Everard** (*née* Sara Jeanette Duncan), Canadian and, latterly, an Anglo-Indian, novelist, was born at Brant-

ford, Ontario, in 1861, and educated at its Collegiate Institute. Early in the eighties she began to write for Canadian magazines and to act as staff-correspondent for Toronto and Montreal newspapers. Her cleverness, fine perception of the weaknesses and eccentricities of human nature and her pervasive humor obtained a connection with the English press and the appointment to act for a literary syndicate in making a tour of the world. The result of the tour appeared in *A Social Departure* and subsequently in *An American Girl in London.* Her later works include *The Simple Adventures of a Mem-Sahib; Vernon's Aunt; A Daughter of To-day; His Honor and a Lady; A Voyage of Consolation* and a delightful book on the author's Indian garden. In 1890 she married the editor of a Calcutta newspaper, a scientist, and has since made India her home.

**Cotopaxi** (*kō'tō-păks'ĕ*), the highest volcano in the world, is a peak of the Andes, in Ecuador, 33 miles from Quito. The earliest volcanic outburst of which we know took place in 1532 and 1533. Many others have happened since. In 1744 its thunderings could be heard 500 miles away; in 1768 occurred the worst eruption, when ashes were carried 130 miles. The mountain is a perfect snow-crowned cone. Smoke can be seen issuing from the crater, sounds like explosions are sometimes heard, and at night a glow is noticed on the sky above the volcano. There is little lava, but during an outburst flame, smok and great quantities of ashes are thrown out. Cotopaxi was first climbed in 1872 by Wilhelm Reiss, who gives the height of the northwest peak as 19,498 feet and the southwest peak as 19,429 feet. The last eruptions were in 1877.

**Cotton.** As early as 1500 B. C. the people of India—and by 1200 B. C. the Greeks, Phoenicians and Egyptians—with primitive appliances, were making cotton cloth of a quality which has been surpassed only by the most skillful manufacturers during the last half century. Cotton either in its wild or cultivated state was used at the date of the discovery of America in practically every country within the 40th parallels of north and south latitude, except in what is now the United States.

COTTON PLANT

Cotton is now cultivated in the United States on nearly all kinds of soils, south of latitude 37, artificial fertilizers being used to increase the yield, or hasten ripening on soils not naturally adapted to it.

THE COTTON QUEEN AND HER DRESSES

The plant belongs to the *Malvaceae*, or Mallow family, and is known by the generic name *Gossipium.* It is a perennial, but under cultivation usually becomes an annual or biennial. Culture in the United States is practically confined to two species, the silky, long-staple Sea Island cotton—*G. barbadence*—grown in the lowland coasts and coastal islands of Georgia and South Carolina; and Upland cotton—*G. hirsutum*—which is of two sorts, short cotton and Upland long-staple cotton. The flowers somewhat resemble single holly-hock blooms and continue to form until frost, opening their pale creamy petals one morning in full maturity for insect pollination, fading to pink by noon, dark pink the second day, and by night are shrivelled ready to be pushed off in a few days by the swelling fruit or boll. Bolls vary from almost spherical to long narrow pointed capsules and are divided into 3, 4 or 5 segments. When the bolls split and the fibres fluff into a twisted mass, the cotton is ready for picking.

ON THE PLANTATION

Cotton requires six or seven months of favorable growing weather between spring and fall frost to mature, but picking may extend far into the winter. It thrives in a very warm or even hot temperature, provided the atmosphere is moist, but it will mature a crop on less water than any other crop plant. Any sudden change in temperature, moisture or cultural methods is apt to cause an abortion of the young fruit and flowers.

Usually cotton is planted on ridges or "beds." Fertilizers, when used, are generally drilled into the beds just before planting. The seed are usually drilled in—about one bushel per acre. When the plants are three or four inches high they are hoed or "chopped" out, single plants being left standing from 12 to 24 inches apart, distance depending upon luxuriance of growth and type of cotton

Generally speaking the best concentrated fertilizer to be used is one containing soluble phosphoric acid, available potash and available nitrogen, although the nitrogen may be omitted if it has been previously supplied with green manure, legumes or barnyard manure.

COTTON PICKING AND GINNING

Mechanical pickers have been devised, but do not show the discrimination of the human being in avoiding immature cotton, nor adaptability to the irregularities of the average cotton field. After picking, the cotton is hauled in large boxed wagons to the gin (see ELI WHITNEY). It is sucked from the wagon through long tubes and distributed directly to the several gins in the gin house. A continuation of this sucking or blowing apparatus collects the ginned cotton and passes it to the compress

where it is compressed in large boxes. From the box it is swung around to the baler, further compressed, covered with coarse burlap and bound with metal straps. Each bale weighing about 500 lbs. is marked for identification and with its actual weight.

HOW COTTON IS BOUGHT

Cotton, the fibers of which are not over $1\frac{1}{8}$ inches long is known as short cotton and is sold by grade from samples taken from each bale. Grading is based on color and relative amount of trash and stained fibers present. Short cotton constitutes the great bulk of that produced in this country and is used in making the cheaper grades of goods. Additional factors of length, strength and uniformity of fiber enter into the value of long staple cottons, premiums generally being given for each $\frac{1}{16}$ inch in length. The finer fabrics, including muslins and laces (*q. v.*) are made from long staple cotton.

The linters or fuzz remaining on the seed of Upland cotton after ginning yields batting, wadding, stuffing for pads, etc., and "lambs wool" for fleece-lined underwear. The hulls are used in cattle feed, fertilizers and paper stock. From the seed oil is made, which is used in lard compounds, cooking and salad oils and soap stocks, while the "cake" (residue after pressing the oil from the kernels) is used in fertilizers, dye stuffs, cattle and poultry feed, confectionery and flour.

ENEMIES OF COTTON

Cotton is subject to diseases, such as leaf blight, shedding of bolls, root, and boll rot and root galls.

The principal insect enemies are the cotton worm, the boll worm, and the Mexican boll weevil. Of these, the weevil is the worst, but by community effort the number of early weevils may generally be so reduced that a crop may be well advanced before the insects become hopelessly abundant.

G. S. MELOY

*U. S. Department of Agriculture.*

**Cotton, John** (1585–1652), an eminent Puritan minister, was for 20 years pastor of Boston in Lincolnshire, England, and for almost as long in Boston, New England. Cotton, whose Puritan leanings made him an object of suspicion under the primacy of Laud, was to have been brought before the Court of High Commission for trial. He escaped, however, to London and, later, to Boston, New England. Both in England and in New England, the reputation of Cotton for learning was of the highest. He had an absolute command of Latin, Greek and Hebrew; and loved "to sweeten his mouth with a piece of Calvin" at the close of his day of twelve hours' study. Cotton opposed Anne Hutchinson, whom he had at first been disposed to favor; and disputed also with Roger Williams. Among his many works was the catechism *Milk for Babes*.

**Cottonworm,** the larva of a moth doing great damage to the cotton-plant by eating the foliage. It is estimated by officials of the United States government that the loss occasioned by this insect in a year of great abundance of cotton-plants amounts to 30 million dollars. The average loss is placed at 15 million dollars. The perfect insect is a small, brownish moth, which flies at night and deposits eggs on the under side of the leaves of the cotton-plant. These eggs hatch in mid-summer within three days, and at once is begun the destruction of the leaves. The larva, when full-grown, is about an inch and three fourths in length, of a light-green color, striped with white and black and spotted with black and yellow. When through feeding, the caterpillar folds a leaf about itself, spins a cocoon and pupates; shortly after emerging, the moth lays her eggs. There may be seven broods in a single season. A related species destroys cotton in the ball. See Riley: *Entomological Commission's 4th Report* (Washington, 1885); *Bulletin No.* 18, New Series (Washington, 1898).

**Cotyledon** (*kŏt'ĭ-lē' dŏn*), the first leaf or leaves developed by an embryo. In seed-plants the cotyledons are developed in the seed, and are more or less different from the usual leaf-form, often being fleshy from containing stored food, as in the bean and acorn. Generally the cotyledons escape from the seed during its germination, but in some cases, as in the acorn, they never leave the seed. See EMBRYO.

**Couch, Darius Nash,** an American general, was born on July 23, 1822, in Putnam County, New York; and died at Norwalk, Conn., Feb. 12, 1897. After graduating at West Point, he served in the Mexican War as lieutenant of artillery. He entered the Civil War as colonel of the 7th Massachusetts. He took part in the battles of Yorktown, Williamsburg, Fair Oaks, Malvern Hill, Fredericksburg and Chancellorsville. He was made major-general in 1862, and was in command of a division in the battle of Nashville.

ELLIOTT COUES

**Coues** (*kouz*), **Elliott,** a notable American ornithologist, was born at Portsmouth, N. H., Sept. 9, 1842; and died at Baltimore, Md., Dec. 25, 1899. After graduating at Columbian University, Washington, D. C., in 1861, he entered the military medical service, and was for a time surgeon and naturalist on the U. S. northern-boundary commission. He was

subsequently collaborator at the Smithsonian Institution, and secretary and naturalist to the U. S. geological and geographical survey of the territories; was chairman of committee at the Psychical Science congress in 1893; and edited a number of works in biology and on comparative anatomy and zoology. His writings embrace a number of works on his specialty of ornithology, among which are a *Key to North American Birds; Birds of the Northwest and of the Colorado Valley; New England Bird Life; Fur-Bearing Animals.*

**Coul'ter, John Merle,** a great authority on American botany and head-professor of botany at the University of Chicago, was born at Ningpo, China, of American parentage, Nov. 20, 1851. After graduating at Hanover College, Indiana, he spent a year as botanist on the U. S. geological survey in the Rocky Mountains. He was afterward successively professor of natural sciences in his *alma mater;* professor of biology at Wabash College; president of the University of Indiana; and president (1893-96) of Lake Forest University. Since 1896 he has been attached to the University of Chicago, in charge of his special department. His published works include a *Synopsis of the Flora of Colorado;* a *Manual of Rocky Mountain Botany; Handbook of Plant Dissection; Manual of the Botany of Western Texas;* and an edition, as editor, of Gray's *Manual of Botany.*

**Coun'cil Bluffs,** a city of Pottawattomie County, Iowa, lies not far from the old meeting-point of the Indian tribes. Here the Mormons tarried from 1846 to 1849, while on their way to Utah. For many years it was the last village in civilized America, and here California emigrants and trappers got their outfits before entering the Indian country. It lies across the Missouri from Omaha, Neb. Six railroads, running west from Chicago, here meet the Union Pacific line, and others turn to the north and south. The city's industries include manufactures of paper, iron, carriages and agricultural machines. Population, 32,000.

**Courthope** (*kōrt'ŏp*), **William John,** an English critic and man-of-letters, was born in Sussex, England, July 17, 1842, and educated at Harrow and Oxford. At the latter he won the chancellor's gold medal for verse, and also was Newdigate prizeman. He was one of the founders of the English *National Review* and a staff member of the *Quarterly Review;* subsequently he was appointed civil-service examiner in the government education department, and was made a Companion of the Bath. From 1895 to 1901 he was professor of poetry in the University of Oxford. He has edited an elaborate edition of *Pope's Works, with Life;* a *Life of Addison* (in the English Men of Letters Series); a *History of English Poetry;* and a burlesque in allegory, entitled *The Paradise of Birds.*

**Courtney, The Right Reverend Frederick, Bishop.** Rector, St. James Church, New York. Born at Plymouth, England, in 1837. Graduated from Kings College, London, 1863. Came to New York in 1876 as assistant at St. Thomas' Church. Was made Rector of St. Paul's, Boston, in 1882, and bishop of Nova Scotia, 1888 to 1904, attended the Lambeth Conference in 1888. He holds honorary degrees from several universities, and is much admired as preacher and bishop.

**Courts of Justice.** Courts of justice in primitive times either were the people assembled or the king and his advisers. Their activity has always been of two kinds: either to punish or to arbitrate. Criminal cases are those in which the community punishes the offender; civil cases, those in which the community decides a dispute. In early days the court was all important; but when the community entrusted justice to a few specially selected men, it laid down laws by which they should be in part guided; and those selected men laid down further rules to guide their successors. So that now a court of justice is always subordinate to a system of law and precedents, which it may not alter, but which it must *interpret* to fit the case before it. In the early Roman republic the people's assembly, the *comitia,* tried all important cases. In the Roman empire there was established a regular system of courts, in which we may distinguish courts of *original jurisdiction* and courts of *appeal.* The former try cases at first hand. An appeal may be taken only from an inferior to a superior court. The Romans also established a distinction still preserved between common law and equity; the former being the laws and customs current in the community, and the latter principles of justice laid down by judges at various times and finally brought together in a system.

Our Teutonic ancestors preserved through the middle ages the right of being tried, not indeed by the whole people, but by some of them, usually six or more, of about the same rank as the accused. That is, they were his peers. This *trial by jury* Englishmen especially held precious, and we in America still regard it as necessary to securing justice. (See the Constitution, Article III, Section 2, and Amendments V, VI and VII). On the continent of Europe, except in the cities, the model generally followed was that of the courts of the church, in which the essential thing was a trained judge. Since the French Revolution, however, the jury-system has become common on the continent.

As our system of courts is largely derived from that of England, we may note

that in that country the lowest court is everywhere the justice of the peace, who in the cities is called a police-magistrate. He deals chiefly with minor offenses and also settles many civil disputes in small matters. But disputes concerning matters that must be entered on the public and permanent records, such as the right to real estate, wills, divorces, etc., are referred at once to local *courts of record*, the borough or county courts. These are called inferior courts. These courts also deal with offenses of greater importance.

Since 1873 the superior courts include the *Supreme Court*. This includes "His Majesty's High Court of Justice," which has such divisions as the Chancery division (dealing chiefly with cases of *equity*), the Kings Bench (or *common law* division), the probate (*wills*) and the admiralty (*navigation*) divisions. All these courts have original jurisdiction. The Court of Appeals includes several divisional courts, and also a final Court of Appeals, the highest regular court in the Kingdom. But in some cases the matter may be appealed to the House of Lords, and in cases affecting India, the colonies and foreign countries the Privy Council is the final court.

In England all judges are appointed, and appointed for life. The English believe with some reason that they have thereby secured a more honest and a more able administration of justice.

The United States courts either are Federal or state courts. In state courts, except that the judges or justices are elected by the people, in most cases for a term of years, the lower courts are very like those of England, both in name and in powers. In some states, the county-judges receive such names as judge of quarter-sessions. But the essential point is that he is a judge of record and that he tries more important cases but not, as a rule, the most important cases.

In some states these county-courts have, besides the above powers, those of a circuit or superior court. Commonly, however, the superior or *circuit-courts* are distinct. They are elected by a larger division of the state, containing several counties, and for longer terms. They have original jurisdiction in the most important cases. There is finally a system of *courts of appeal*, including two or more divisional courts, and then a final court of impeachment for the trial of judges and of the executive. The distinction between courts of law and courts of equity is preserved only in a few states. Most states have a special county-judge for dealing with the property of persons deceased. His court has various names, as surrogate's, prerogative or orphan's court. In general, the higher judges are elected or appointed for longer terms. In many states they hold office for life and during good behavior. In a few cases they are elected, not by the people, but by the legislature. In a few others the governor appoints them.

Federal courts include the senate as a court of impeachment (see CONGRESS), the Supreme Court, the Court of Claims, Commerce-Court and District-Courts. The Supreme Court consists of nine judges, the Chief-Justice and eight associates; but the number may be increased at the will of Congress; which also may, on the death or retirement of a justice, refuse to provide for a successor. The justices are nominated by the president and confirmed by the senate. They are appointed for life, but may be removed by impeachment. All federal judges are thus appointed. The supreme court was established by the constitution, and cannot be abolished by Congress; but the circuit and district-courts as well as the court of claims may be so abolished. The supreme court sits at Washington from October to July each year. There are nine circuit-courts, to each of which a supreme-court justice is assigned. There are 25 circuit-judges (1903). Each circuit has two kinds of courts: (1) a court of orginal jurisdiction, which may consist of the supreme-court justice of the circuit, or a circuit-judge, or a district-judge of the circuit or any two of them; (2) a circuit-court of appeals, to which cases from the first class or from district-courts may be appealed. This consists of three judges of the circuit, but must not include the judge who tried the case. There are 69 district-courts, with a judge, clerk, marshal and attorney. Appeals may be made from the district-court to the circuit-court of appeal; and in important cases from that court to the supreme court. The court of claims deals with claims of private persons against the Federal government; appeals from its decisions are direct to the supreme court. The courts in the territories and in the District of Columbia are established by Congress, but are not Federal courts. The judges serve for four years; whereas all Federal judges are appointed for life. The Federal courts may only try cases which are directly removed by the constitution from the decision of the state-courts. Wherever a state-court faces the question of whether a Federal treaty or statute or act of authority is valid or applicacable to a case in dispute, and decides that it is not valid or is not applicable, then the person who claims that it is, has the right of appeal to the Federal court, as a state is not competent to decide on such a matter. However, no person has the right to force a state into the courts (Eleventh Amendment). In all criminal cases and suits at common law before a Federal court, a Federal jury must be summoned to try the

case. The supreme court tries all cases concerning ambassadors and other ministers from foreign countries and all cases where a state brings action against another state or the citizens of another state or a foreign country. In these cases the suit is at once brought before the supreme court; but in other cases—which include, besides those mentioned already, cases that involve laws of navigation and controversies wherein the United States is a party—in all such cases the state-courts or lower Federal courts must try the matter first, and appeal may then be made according to the principles already mentioned.

The Federal courts do not create laws, and are bound even more strictly than state-courts to interpreting the law, viz., the constitution and the enactments of Congress, always preserving the sovereignty of the constitution. It is wrong to speak of the supreme court as superior to Congress, in contrast with the British courts, which are subordinate to Parliament. The difference is that in England the Parliament is superior to all authority whatsoever, there being no constitution to overrule it, while in America, Congress and the supreme court alike are subject to the constitution. Of course the will of the people is the final judge in both countries. At the same time, because the supreme court has the duty of interpreting the constitution, which needs a great deal of interpreting to apply it to all the changes of modern life, it has in fact a great deal to say as to what regulations shall govern us. For example, the constitution does not forbid, explicitly, a graduated income-tax; but the supreme court forbids it by its interpretation of the constitution. The constitution being difficult to amend, that interpretation, and nothing else, prevented at one time the collecting of such a tax.

In like manner the state-courts of every state have the power of interpreting the constitution of the state and of deciding whether the acts of the legislature and executive are in accordance with it. Whenever Federal or state-courts decide against the constitutionality of an act, it is void, as if it had never been passed or done. But it is the rule that where there is doubt in the matter, the benefit of the doubt is to be given to the act or statute.

PERCY HUGHES.

**Courts-Martial,** in their modern form, as regular tribunals set up by Congress or in minor cases by a military or naval commander, for the trial of offences against martial law or discipline in the army, navy or marines, date from an ordinance of Charles I, and are referred to in the first mutiny-act of William and Mary. Both in America and England there are several grades of courts-martial. In the highest or general courts, the more serious offences and also all charges against commissioned officers are tried. Often, when evidence is to be gathered, courts of inquiry are set up for this purpose. These courts in America may summon witnesses upon oath; but in England they have no such legal powers. When sentence of death is decreed, it is usually by shooting. The old-fashioned drumhead courts-martial, held upon the field before passion had time to cool and before full evidence could be gathered, are no longer held. Summary courts may, however, be held, in America in the place of regimental and garrison courts, and in the British army chiefly to try offences committed upon active service abroad, when it is difficult to have the offenders tried in the ordinary courts. The more serious offences are never tried by such courts, which in the United States consist of but a single officer. Courts-martial have the defect that their members belong to one and the same class, and may have a special army or navy sentiment. In 1757 Admiral Byng was sacrificed by an English court-martial to popular clamor, and shot, having perhaps made an error of judgment in avoiding battle with a vastly superior fleet. Great public interest has recently been shown (1907) in the sentence of a company of negro troops to disbandment under martial law by President Roosevelt. In a court-martial the prisoner at present has much the same privileges of having an advocate, a right to reply, etc. as in the ordinary criminal courts. The judges are of equal or superior rank to the prisoner.

**Cousin** (*kōō'zan'*), **Victor,** founder of a school of philosophy, was born at Paris, Nov. 28, 1792. After finishing his studies he was appointed professor at the Sorbonne. He early began to write, and one of his first books, his translation of Plato, met with immediate success. His lectures drew crowds; his ideas, for the most part, were new to his hearers, bold, clear and beautiful in style; he also had a wonderful power in bringing together facts of history and philosophy so as to throw light on each other. He also took part in politics, and was one of the leaders of thought in Paris. So when his friend Guizot, in 1830, became prime minister, Cousin was made a member of the council of public instruction and also a peer of France. He also held other offices, and was a public man until 1849. His teachings have had great influence in Germany, England and America as well as in France. Among the best-known of his books are *The True, the Beautiful and the Good* and *The History of Philosophy.* He died at Cannes, France, Jan. 13, 1867.

**Covenanters,** a body of the Scottish people, including the greater part of the nation, who during the 16th and the 17th centuries bound themselves by *Covenants*

to make and keep the Presbyterian church as the only religion of Scotland. The first was drawn up by John Craig in 1581 and signed by James I. Others like it followed, and in 1638 was drawn up the Solemn League and Covenant, a bond between those opposed to the Catholic and Episcopal churches in Scotland, England and Ireland. It was adopted by the English Parliament. But in Charles II's reign, the covenant-oaths were declared unlawful and, later, treasonable; yet many of the Covenanters kept on taking these oaths until the Revolution of 1688 made it no longer necessary for the Scots to band together for the liberty of their church.

**Cov'entry** (*kŭv'en-trĭ*), a city of Warwickshire, England, about the middle of the kingdom, between the four English ports, London, Bristol, Liverpool and Hull. Its chief manufactures are ribbons, watches, bicycles and cloth. St. Michael's Church, built between the years 1230 and 1395, is the largest parish-church in England, its spire 200 feet in height. St. Mary's Hall, built in the 14th century, with its carved-oak roof and large painted window, is a fine example of ornamental work. In 1043 Earl Leofric and his wife, Lady Godiva, founded here a monastery. In Tennyson's *Godiva* is told the story of this lady's famous ride, clothed only by her long hair, through the streets of Coventry, while the people reverently kept within their houses behind closed blinds. This was the barbarous condition made by her husband, the lord of the town, when she pleaded that the citizens might be freed from harsh taxes. In memory of her there used to be splendid processions in Coventry. Here also Richard II stopped the trial by battle between the Dukes of Norfolk and Hereford, of which Shakespeare has so well told us in his *Richard II*. Here for a time Mary, Queen of Scots was imprisoned, and near the town was one of George Eliot's homes. Population 69,978.

**Cov'erdale, Miles,** editor of English versions of the Bible, was born in Yorkshire, England, in 1488. He studied at Cambridge, became a priest, and soon left the country. His edition of Tindale's and other men's translations of the Bible came out in 1535. The Psalms of this translation are still used in the Book of Common Prayer, and many of the most beautiful phrases in the famous King James' version are due to Coverdale. It was printed in German black-letter, in double columns, with wood-cuts. In 1538 Cromwell sent him to Paris to take charge of another translation, but the work was stopped and many of the sheets burned. However, the presses and type were smuggled into England, and the translation was brought out; it is known as the Great Bible. Coverdale was also editor of Cranmer's Bible. He was made bishop of Exeter, but was forced to leave England when Mary I came to the throne. He died in 1568.

**Coverly, Sir Roger de,** a fictitious character in Addison's paper, *The Spectator*, who has charmed lovers of literature for two centuries.

**Covington** (*kŭv'ĭng-tŭn*), the capital of Kenton County, northern Kentucky, on the Ohio River, opposite Cincinnati, to which it is joined by two fine suspension-bridges. Many of its people are Cincinnati business men; but it is more than a mere suburb of that city, having large distilleries and manufactures of glassware, nails and tobacco. It also has large industries in rolling-mills and in the manufacture of stoves, etc. The Licking River separates it from Newport, Ky. Covington is the seat of a Roman Catholic bishopric, and possesses good schools, churches, a hospital, orphan-asylum and public library. Population 53,270.

**Cowbird,** a bird found in fields feeding near cattle, picking up the insects the animals disturb in their grazing. It sometimes rides on the back of a cow, and often may be seen just in front of one. It makes no nest, but, like the European cuckoos, lays its eggs in the nests of other birds—usually in the nest of a smaller bird. The young cowbird is larger than the other nestlings, but the deception does not seem to be noticed by the foster-mother. The male cowbird is glossy, greenish-black, with head and neck dark coffee-brown. The female is dirty brownish-gray, with whitish throat. They live in small flocks.

COWBIRD

**Cowboy.** See RANCHING.

**Cow'ley, Abraham,** an English poet, was born at London in 1618. His father died before his birth, and it was through his mother's struggles that he got a university education. It was by reading a copy of Spenser's *Faerie Queene*, when hardly more than a child, that he came to write poetry. When ten years old, he wrote good verses, and brought out a book of poems when 15. On the breaking out of the Civil War, he followed the queen in her flight to Paris, and wrote letters in cipher for her to King Charles. Cowley's best known works are *Pindarique Odes* and *The Mistress*. During his lifetime he was held to be the greatest of English poets, but now he is little read. This is probably because he wrote for the court and for the taste of the people of his own time. Nevertheless, some few passages of his are powerful. He also

wrote essays, which are much better known than his poetry and rank with those of Goldsmith and Addison. He died on July 28, 1667.

**Cow-Peas,** a very important leguminous crop for forage and for adding fertility to the soil. They can be grown on soil too poor to support clover. (See NITROGEN-GATHERING CROPS). Its hay yields more dry matter and digestible protein than clover. (See BALANCED RATION.) Being susceptible to frost, the cultivation of most varieties is confined to the southern states. The soy-bean is another leguminous plant much grown for similar purposes. The seeds of both form a valuable concentrated food.

**Cow'pens,** a village of South Carolina, near which the British under Colonel Tarleton were defeated by the Americans under General Morgan, Jan. 17, 1781. Cornwallis dispatched Tarleton with 1,100 choice troops to drive Morgan into North Carolina. The forces met in an open wood known as Hannah's Cowpens. The Americans, who numbered about 1,000, were drawn up in two lines, with an advance corps of riflemen and a small cavalry reserve. The British charged, driving the riflemen back to the first line; when within bayonet thrust, the first line fell back on the second. A misunderstood order threw the Americans into confusion, and Morgan ordered a retreat to a slight rise where the cavalry were posted. On came the British, but just then the dragoons charged, and at the same time the rear line faced about, poured in a volley at close range, and charged bayonets. The British line was broken and put to flight. The British loss was 800 or 900; the Americans lost 72.

**Cowper** (*kōō'pĕr* or *kou'pĕr*), **William,** a celebrated English poet, was born in 1731 in Hertfordshire, England. When very young he was sent to Westminster School, where, he complains afterward, "he learned the infernal art of lying." One of his school-fellows was Thurlow, who jokingly promised him an appointment when he should be lord-chancellor, but failed to keep the promise. Cowper studied law and was offered by a cousin a clerkship in the house of lords. But the candidate would have to appear before the bar of the house, and this thought unmanned the poet. A fixed idea that every one was his enemy, the forerunner of madness, took possession of him. He tried to kill himself on several occasions, and for a time was confined in an asylum. After recovering his health, he met his good angel, Mrs. Unwin, in whose family, at Olney, he lived for some time; but his madness burst out again suddenly while he was making a call at the house of his friend, John Newton. He stayed there a year, refusing to go back to his own house, though it was but next door. In 1779, though he never fully recovered, began the brightest period of his life. As yet he had not written a line, but he followed Mrs. Unwin's counsels like a child, and when, to occupy his mind, she asked him to write poetry, poetry he wrote. He had also made the acquaintance of Lady Austen, another angel whose smiles put life into his brain, and her playful request that he write her a poem on something or other, "this sofa, for instance," resulted in *The Task*, Cowper's greatest work. One morning he also read her the famous ballad *John Gilpin*, the story of which she had told him the night before. In 1787 came on another attack of his old trouble, and again he made an attempt upon his life. Yet in these last gloomy years he wrote two of his most beautiful poems, one *Addressed to My Mother's Picture* and another to *My Mary*. See his biography, by Prof. Goldwin Smith, in the English Men of Letters Series. He died on April 25, 1800. Mrs. Browning was inspired by the pathos of his life to write one of her most poignant and appealing poems.

**Cow'slip,** a common native flower of English pastures, to be met with also in many other parts of Europe. It is a delicate, modest little flower, a great favorite both for its beauty and fragrance. It differs from the common primrose, in having umbels or spreading flower-clusters. These clusters or bells were long thought to be the haunts of fairies, and are still sometimes called fairy-cups. The flower commonly called Cowslip in America is a quite different blossom, a member of the Crowfoot family. It also is known as the Marsh Marigold, but is neither true Marigold nor true Cowslip. In appearance it closely

COWSLIP

resembles the buttercup. By whatever name called, the yellow of the blossom is purest gold, the glossy leaves are of richest green, the familiar cowslip a gladsome blossom of the spring. It grows in marshes, often quite deep in water, and is found north of Carolina and west to the Rocky Mountains. Its stem is hollow, its branches bearing both leaves and flowers. The upper leaves grow on very short stems, thereby not shading the lower leaves, all spreading out broadly to the light. The young plants are sometimes used for "greens." The season of flowering is quite long, from April to June.

**Cox, Sir George William,** an English cleric and historian, was born in 1827, and educated at Rugby and at Trinity College, Oxford. He held several curacies, and became rector of Scrayingham in Yorkshire. He wrote largely on Grecian history and mythology. His chief works are *A Manual of Mythology; Mythology of the Aryan Nations;* a *History of Greece; Introduction to the Science of Comparative Mythology and Folk-Lore;* and a *Life of Bishop Colenso.* With Dr. Brande he edited a *Dictionary of Science and Literature.* His death occurred in 1902.

**Cox, Jacob Dolson,** an American soldier and statesman, was born at Montreal, Oct. 27, 1828. He studied law and began practice in Warren, O. He was a member of the state senate when the Civil War began in 1861, and also was a brigadier-general of militia. He at once entered the Federal army and rendered conspicuous service throughout the war, taking part in many of the important battles and advancing to the rank of major-general. He was elected governor of Ohio, in 1866; was secretary of the interior in President Grant's cabinet in 1869; member of Congress from 1877 to 1879; and in 1885 became president of Cincinnati University. General Cox's qualities as a student and scholar, as well as a brave and capable general, gave value to his contributions to history of the great struggle, which include *Atlanta* (1882); *The March to the Sea* (1882); and *Military Reminiscences,* the latter being published after his death (Aug. 4, 1900).

**Cox, Kenyon,** American painter, was born at Warren, O., Oct. 27, 1856, and studied art in Cincinnati, Philadelphia and Paris. In the latter city he was a pupil of Gérôme. In 1882 he became a member of the Society of American Artists, and settled in New York to pursue his profession. His pictures are chiefly portraits and figure-pieces, together with designs for book-illustration. Among the latter is his work done on Rossetti's *The Blessed Damozel;* he has also painted decorations in the Library of Congress and in the Walker Art-Gallery of Bowdoin College.

**Cox, Palmer,** American artist and author, was born at Granby, Quebec, April 28, 1840, and was educated at the academy of his native town. In early manhood he drifted to California, where he developed his native taste for drawing and sketching, while at the same time contributing to periodicals. He afterward returned east and settled in New York, where he contributed and illustrated a series of popular papers for the young, later published as *The Brownie Stories, The Brownies at Home, The Brownies through the Union, The Brownies in Fairyland,* etc. He also issued *Queer People with Claws and Paws; How Columbus Found America,* etc.

**Cox, Samuel Sullivan,** American politician and diplomat, was born at Zanesville, O., in 1824, and died at New York on Sept. 10, 1889. After graduating at Brown University he became editor of *The Statesman,* a Columbus, Ohio, journal, in which appeared a flowery description of a sunset, which earned him the sobriquet of Sunset Cox. For over 30 years he was a member of Congress, where his humor and debating power earned him influence. In 1885-86 he was United States minister to Turkey. He was the author of several works, among which are *A Buckeye Abroad; Eight Years in Congress; Why We Laugh;* and *Three Decades of Federal Legislation.*

**Coyote** (*kī-ōt'* or *kī-ō'tē*). See WOLF.

**Crab,** a short-tailed relative of the lobster and fresh-water crayfish. The lobster and crayfish each have a long tail, and so has the crab during its early life; the reduction of the tail is a case of modification. The crab is the highest member of the class of animals (*Crustacea*) which contains the shrimps, prawns, lobsters and crayfish. It has five pairs of legs and on this account is often called a *Decapod* or ten-footed animal. The first pair of legs ends in large claws, somewhat like those of the lobster, but smaller; the other four pairs are walking legs. The head-end is covered by a broadly expanded buckler or

CRAB

shield. (See illustration.) This is an outgrowth of the horney covering of the body,

and it covers the segments or rings of the body that are closely crowded under it, and serves to conceal the fact that the entire body of the crab is really composed of a number of segments. Those in the tail, or abdomen, are clearly separate joints, but those in front are much modified, crowded together, and covered by the before-mentioned buckler. This is technically named the carapace. It serves also to cover two gill-chambers on each side of the body. The gills are feather-like expansions of a membrane that is richly provided with blood-vessels. Within each gill-chamber is a water-scoop, the movement of which throws the water out in front and keeps a current of water running over the gills. On the head are short antennæ and eyes on stalks; the stalks are short in the common crab, but in some of its relatives are of considerable length. The horny outer covering is the same kind of substance (chitin) that forms the wing-covers and hard parts of insects, but in the case of the crabs it also contains a limy or earthy substance. As the animals grow, the outer covering becomes too small, and moulting is necessary. The hard shell is cracked and thrown off, through great exertions on the part of the animal. The moulting process takes away, also, the lining of the mouth and stomach and the outer covering of the eyes. The deserted shells are often to be picked up. The new shell is at first thin and flexible; it begins to form under the old one before the latter is cast off. Directly after moulting, while the shell is still soft, the animals are shy and conceal themselves. The eggs of the common sea-crabs are attached, underneath the tail, to the swimming appendages, and the young hatch there. The young of the crabs pass through several stages after hatching, before they come to look like their parents. In all of these early stages they have long tails, and, in one of them, they resemble the lobster. There are many varieties of crabs: The fiddler-crab has one large claw and one small one; the large claw is held in such a manner as to suggest a violin, and the small one in such a position as to represent

FIDDLER-CRAB

the bow. The spider-crab resembles in a general way a large spider. Some are good swimmers and others live upon the land. Some kinds are eaten. The largest known crab is a marine form of Japan, which is 22 inches between the biting claws. Some of the land-crabs are swift runners and live in holes. In the island of Ceylon one of the latter catches young birds, and even young rabbits are drawn by them from their holes and eaten.

**Crabbe** (*krăb*), **George,** an English poet, was born on Christmas Eve, 1754, at Aldeburgh, England. He served as a surgeon's apprentice, where he had to help the plowboy, and also picked up a little surgery at odd hours while working in his uncle's warehouse in London. But after a three years' struggling practice at home, he went to London with $15 in his pocket to try his fortune as a writer. He fought poverty bravely, having at times of stress to pawn his clothes and surgical instruments. At last, threatened with arrest for debt, he timidly left a letter at Burke's door and paced Westminster bridge all night till daybreak. But the great Burke was generous, and from that hour Crabbe was a made man. He became a clergyman and a busy writer. *The Village*, *The Parish Register* and *Tales of the Hall* are some of his poems. Many he never published, but burned yearly in a grand bonfire. Jane Austen is stated to have said that the poet was the only man she would care to marry. Byron, Wordsworth, Scott, Jeffrey, Cardinal Newman and other writers have praised his life-like painting of the scenery, fisherfolk and peasantry of his neighborhood. He died on Feb. 3, 1832.

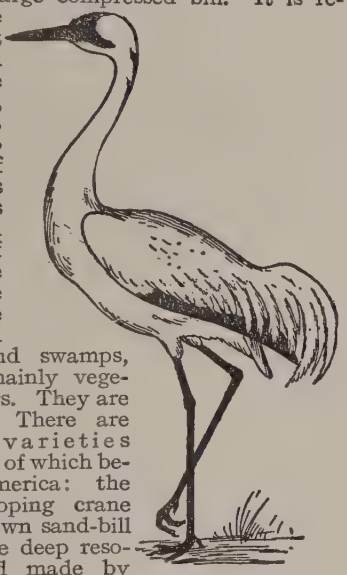
**Craigie, Mrs. Pearl Mary** ("John Oliver Hobbes"), Anglo-American novelist, was born at Boston, Mass., Nov. 3, 1867, and was the daughter of J. Morgan Richards. She was privately educated, and studied music in Paris and the classics at University College, London. In 1887 she married Reginald Walpole Craigie, and after a separation obtained a divorce in 1895 and the custody of her child. Meanwhile she had been received into the Roman communion. Her literary career began in 1891 with the publication of *Some Emotions and a Moral*, which was followed by *The Sinner's Comedy*, *A Study in Temptations* and *The Gods, Some Mortals and Lord Wickenham*. In these clever stories she showed herself a brilliant writer and a master of epigram. Her later work, besides the novel, *The School for Saints*, consisted chiefly of plays, of which the most successful was *The Ambassador* and a drama entitled *Repentance*. She died on Aug. 13, 1906.

**Craik** (*krāk*), **Mrs. Dinah Maria Mulock,** was born at Stoke-upon-Trent in 1826. When but a girl she supported her invalid mother and ten younger brothers by writing stories for fashion-magazines. In 1849 her first novel, *The Ogilvies*, came out, and she afterward brought out some 50

works—novels, poetry and essays. Her fame rests chiefly on *John Halifax, Gentleman*, published in 1857, one of the most popular books of the century, and translated into French, German, Italian, Greek and Russian. She died in Kent in 1887.

**Cran'berry,** the general name of the trailing species of *Vaccinum*, a genus belonging to the heath family. In North America there are two species of true cranberry, the small (*V. oxycoccus*) and the large (*V. macrocarpon*). They grow in swamps, and the red berries, ripening late, are familiar in the markets. The large cranberry is more extensively cultivated in the United States, the three centers of cultivation being Cape Cod, New Jersey and Wisconsin.

**Crane,** a large, long-legged bird with long neck and large compressed bill. It is related to the rail and not far removed from the herons, though it is wrong to call any of the herons a crane as is done in the case of the blue heron. The cranes live mostly in marshes and swamps, and are mainly vegetable feeders. They are migratory. There are about 17 varieties known, two of which belong to America: the white whooping crane and the brown sand-bill crane. The deep resonant sound made by the whooping crane is produced by a coil of the windpipe, in the breastbone. The windpipe of this species is four or five feet long, and 28 inches of it are coiled in the front part of the breastbone.



WHOOPING CRANE

**Crane,** in mechanics, steam-driven or run by electricity, used for hoisting girders, large stones or other heavy weights, and depositing such on trucks to be moved elsewhere. Traveling cranes are in use also on docks and wharves, where they load and unload machinery, general cargo and heavy merchandize from ship's holds, and also raise anchors and perform similar services. The common type of crane consists of an upright post or revolving shaft, with a projecting jib or arm, at the upper end of which is a fixed pulley, with winding gear, and the windlass on which the tackling is wound. Cranes are commonly constructed of cast-iron and steel, and are fitted with brakes and stopping gear, like other hoisting machinery. Other varieties in ordinary use include derrick, pillar, bridge, walking, traveling and locomotive-cranes severally in use for specific purposes.

**Crane, Stephen,** American author, journalist and war-correspondent, was born at Newark, N. J., Nov. 1, 1871, and died near Baden, Germany, June 5, 1900. He began newspaper work at the age of 17, and was a correspondent for the *Westminster Gazette* and the N. Y. *Journal* in the Greco-Turkish and the Spanish-American war. He shortened his life, however, by overwork, for between 1892 and 1900 he produced some 14 works in fiction, besides his labors as a war-correspondent. His style is wonderfully graphic and powerful. His best-known works are *The Red Badge of Courage; The Black Riders* and *The Eternal Patience.*

STEPHEN CRANE

**Crane, Walter,** English decorative artist and painter, was born at Liverpool, England, Aug. 15, 1845, studied under W. G. Linton, the eminent wood-engraver, and was appointed on the committee of the general exhibition of water-color drawings in 1879. He was a knight-commander of the Order of the Royal Crown of Italy. He also for a time was member of the Institute of Painters in water-colors and oils, and was first president of the arts and crafts exhibition founded by him in 1888. He was perhaps most widely known by his work as a book-illustrator and designer of children's picture-books. The Walter Crane toy-books have found their way, it may be said, round the world. His chief canvases include *The Renaissance of Venus* and *The World's Conquerors.* In 1892 he issued *The Claims of Decorative Art;* in 1896 *The Decorative Illustration of Books;* and in 1898 *The Basis of Design.* He died March 15, 1915.

**Cran'mer, Thomas,** Archbishop of Canterbury, was born at Aslacton, England, July 2, 1489. As a boy he could ride the roughest horse in the shire, and was a keen hunter. He studied at Cambridge, gained a fellowship, and stayed 26 years. In the summer of 1529 he met two officers of Henry VIII, and, the talk turning on the king's divorce, Cranmer said that Henry could satisfy his conscience in that matter by appealing to the universities of Christen-

dom. This pleased Henry much; and the king asked: "Who is this Dr Cranmer? Marry, I trow, he has got the right sow by the ear." So Cranmer became royal chaplain, was sent on embassies to Italy and Germany, and made archbishop of Canterbury. The king found in Cranmer a pliable tool; the servant divorced the master from Catherine, Anne Boleyn and Anne of Cleves. He pleaded timidly in behalf of Anne Boleyn and on behalf also of Henry VIII's vicar-general, Thomas Cromwell; still, if Henry said they were guilty, guilty they were in Cranmer's eyes. Cranmer was instrumental in having the Bible translated, and drifted toward Protestantism. The dying Edward VI won him over to signing the paper that was to make Lady Jane Grey queen instead of Mary. Under Queen Mary the persecuting statutes against heretics were revived, and one of the chief men of the time to suffer was Cranmer, who was condemned for treason, then retried as a heretic. From Oxford gaol he saw the reformers Latimer and Ridley die at the stake, and panic-stricken wrote seven recantations, the last on the morning of March 21, 1556. At once he was taken to church, where he listened to a grim sermon in which he learned that he must burn; but when he was to read his recantation, he instead took back all he had said "from fear of death." He went to the stake cheerfully, and, thrusting his right hand into the flame, kept it there saying: "This hath offended; O this unworthy hand!" See Tennyson's *Queen Mary* for an appreciative view of Cranmer's character.

**Cran'ston, Rhode Island,** a town in Providence County, made up of several villages, with many attractive residences, on the New York, New Haven & Hartford Railroad, and on the western shore of Narraganset Bay about nine miles southwest of Providence. A state-prison, insane asylum, reform-schools, almshouse and workhouse have their seat here. The town was settled early in the 17th century, and incorporated in 1754. Besides its extensive cotton manufactures, it has wire-works, a large brewery and considerable market-gardening. Population, 25,201.

**Crawfish** or **Crayfish,** a fresh-water animal like the lobster, but of smaller size. The front part of the body is covered by a shield-like expansion of the outer shell. This takes in the head and what corresponds to the chest or thorax; it is an expanse of the horny covering of the body, which is made of chitin and hardened by deposits of lime therein. The expansion covers two gill-chambers—one on each side. There are from 18 to 20 pairs of feather-like gills, which are membranous and richly provided with blood-vessels. A gill-bailer lies in the front of each gill-chamber, the movement of which throws the water out of the chamber in little jets and keeps a current of water flowing over the gills. The crayfish is composed of a series of body-rings, but those in front are so crowded together and modified, that it is difficult, at first, to appreciate this fact. If the shield-like expanse (*carapace*) is removed, the furrows separating the segments can be seen. The tail (or abdomen) is composed of six similar rings, and each ring bears a pair of appendages—called in this position swimmerets. The fact that every ring bears one pair of appendages is the key to determining the number of segments in the entire body. If we count the appendages in that region covered by the carapace, we shall find, in all, 14 pairs, and, since each pair represents a ring or segment, we know that there are 14 segments

CRAWFISH

crowded together in the front end of the body. The 14 pairs of appendages are the eyes, the small and the large antennæ, the jaws, surrounded by five pairs of modified mouth-parts; and, finally, the five pairs of limbs. The first pair of these ends in large claws, and the next two pairs in small claws. The crayfishes live abundantly in streams, and often make holes in the bank. They are omnivorous eaters, dead fish, water-snails, tadpoles, frogs, larvæ of insects, vegetable matter in the water and the like being all devoured. The eggs are attached to the swimmerets, and, for some time after hatching, the young cling by their claws to the swimmerets of the mother. They moult or cast off the outer shell, including also the lining of the mouth and stomach, which is horny in nature. The processes of life in the crayfish duplicate those of higher animals, and Huxley showed how a study of the structure, development, distribution and physiology of this one animal introduces us to the general facts of zoology. See Huxley: *The Crayfish.* See CRAB.

**Crawford, Francis Marion,** cosmopolitan American novelist and son of a sculptor, was born at Bagni di Lucca, Italy, Aug. 2, 1854, and was educated partly in the United States and partly in Italy, and had a private tutor at Trinity College, Cambridge,

England. He afterward prosecuted his studies at Karlsruhe and at Heidelberg; studied Sanskrit at Rome; and in 1879 proceeded to India to edit a newspaper, *The Indian Herald*, at Allahabad. From 1881 to 1883 he was in America, but after that time for the most part resided at Sorrento in Italy. He published more than 40 novels, from *Mr. Isaacs* in 1882 to *The White Sister*, 1909. His fertility as an author was no less extraordinary than was the wonderful variety and rich interest of his romances. He was one of the most cultured of modern writers of fiction, and his novels, though rarely realistic and hardly ever dependent upon dialect, invariably interest and instruct. The following are others of his novels: *Saracinesca; Marzio's Crucifix*; *Sant' Ilario*; *Don Orsino; Casa Braccio; Zoroaster; A Rose of Yesterday; Corleone;* and *Ave Roma Immortalis*. He died April 9, 1909.

F MARION CRAWFORD

**Crawford, Thomas,** an American sculptor, was born at New York in 1814. In 1834 he went to Rome, where he worked under the guidance of Thorwaldsen, the great sculptor. His finest works are the *Washington Monument* at Richmond and the bronze statue of *Liberty* on the dome of the Capitol at Washington. He died at London on Oct. 16, 1857.

**Crawfordsville, Ind.,** a city, the county-seat of Montgomery County, on the Cleve., Cin., Chic. & St. Louis, Vandalia and Monon railways and T. H., I. & E. traction line, 43 miles northwest of Indianapolis. Platted in 1823, it was incorporated as a city in 1865. It is the seat of Wabash College (Presb.), and is famous for the number of distinguished writers it has produced. Its manufactures consist of wire-fence works, wagon, spoke and curb factories and foundry-products, in addition to lumber-mills, carriage-works, etc. Population, 9,371.

**Crayfish.** See CRAWFISH.

**Creamery,** a dairy-factory enterprise for making butter, cheese and condensed milk, familiar in the chief eastern and middle-western states of the Union in the past 20 years. They are conducted usually by stock or co-operative companies, or by private individuals having experienced and skilled men to conduct and manage them. Recent returns show that close upon 6,000 creameries are in operation over the country; and in the best of them, which now produce a high-grade output, they confine themselves either to butter or to cheese-making, rarely making both in one factory. The states which today have the largest number of creameries are New York, Pennsylvania, Wisconsin, Illinois and Minnesota, their seat being in the principal dairy-regions. When the milk is delivered by the farmer to the factory, it is weighed, tested as to quality, and its value credited to the owner-producer; the cream is then separated by power (if it has not previously been separated before being brought to the factory), the farmer usually receiving the skim-milk for feeding. The more general plan followed to-day by the producer is to use the local separator-factory or skimming-station, only the cream being taken to the creamery, thus reducing the cost and trouble of hauling.

**Cream-Separator,** a machine for taking cream from milk, which depends on the physical principle that the heavier a whirling body is, the greater its tendency to fly from the center. The milk is passed into a vessel revolving at a high rate of speed on its own center. The cream, composed largely of butter-fat, being lighter, stays in the center and escapes by a tube. The heavier skim-milk, flying to the outer sides of the vessel, escapes through perforations into an outer jacket and is carried away by another tube. The machine can be adjusted to separate cream of any desired thickness between certain limits. This thickness can be accurately measured in terms of percentage of butter-fat. 98% of butter-fat can be thus separated as against 75% by the old-fashioned shallow-pan skimming, or 85% by the better deep-setting method, in which cans about 20 inches deep are set in cold water over night and the skim-milk drawn off from below by a faucet. The separator has the advantage of acting quickly and so making it possible to market the cream with much shorter exposure to the air. Separators will handle from a few pounds of milk per hour up to 4,000 pounds. The smaller ones are usually operated by hand-power. The separator works best at a temperature of between 85 and 100 degrees Fahr Separator-cream is much purer than that obtained by the gravity-methods, because the impurities, being heavy, fly from the center along with the skim-milk. The separator has made possible the rapid growth of creameries as an organized industry, there being over 5,000 in United States in 1905. These can make butter more economically and of more uniform grade than can be done on the farms. Hand-separators enable the owner of a small number of cows to handle less bulk than he would in hauling milk to a creamery. See, also, BABCOCK TEST.

**Creation, The,** an oratorio by Joseph Haydn, composed during the years 1796-8. The words are selected from *Genesis* and Milton's *Paradise Lost*, with modifications by Baron von Swieten. The oratorio was first produced at Vienna, April 29, 1798, and ranked next to *The Messiah* in popularity until the appearance of Mendelssohn's *Elijah*.

Haydn placed a higher estimate upon *The Creation* than he did upon his second oratorio, *The Seasons*, written during 1798-1800.

**Crécy** (*krā'sē'*), a town of France, where, on Aug. 26, 1346, Edward III of England, with about 30,000 men, won a brilliant victory over 100,000 French under the Count of Alençon. The flower of French chivalry, together with the blind king of Bohemia, who was fighting on the side of France, fell in this battle. In all, fully 30,000 French bit the dust. Here the Black Prince gained his spurs and adopted the threefold feather-crest of the fallen Bohemian king, with the motto *Ich dien* (I serve), still worn by the Princes of Wales. The battle was one of the earliest in which cannon were used by the English.

**Creeks,** an Indian tribe, living, when first seen by De Soto in 1540, on the Flint, Chattahoochee, Coosa and Alabama Rivers in Florida. Their own account of themselves is that they came out of the earth, and marched from the northwest to the lands then held by them. From their language, they probably are of the same race as the Choctaws and Chickasaws. Their alliance was courted by the Spaniards in Florida, by the French in Louisiana and by the English in Carolina. During the Revolutionary War they attacked Wayne's army, and at its close many Tories joined them. Washington got some of their chiefs to come to New York and sign a treaty; but they continued still hostile. In the War of 1812 they surprised Fort Mimms, killing 400 men, women and children. They were at once attacked by United States troops and defeated seven times, the last time being utterly crushed by General Jackson at Horseshoe Bend. When hopeless, having lost 2,000 warriors, their country ravaged and their towns laid in ashes, they submitted. Nevertheless, the government treated with them for years before it succeeded in getting them across the Mississippi. One chief, General William McIntosh, who signed a treaty in 1825, was put to death by his enraged countrymen. But when, in 1836, some of the Creeks had attacked the frontier towns of Georgia and Alabama and had been defeated by General Scott, about 25,000, who were still left on their old grounds, were at once sent to join the rest of their nation, between the Arkansas and Canadian Rivers. In the Civil War some joined the north and some the south. Schools and churches were late in obtaining a footing with the Creeks, as their only idea of Christianity was what they learned from the negroes, and the proud warriors would have nothing to do with the slaves' religion. Their government was peculiar. Each town had nothing to do with the others, but was ruled by its own *micco* or king, who was chosen as a ruler. Next to him was the war-chief. Every town had a square in its center, shut in by houses, the *micco* and war-chief having special houses. On this square was held their great feast.

**Creeper, Brown,** a little, brown, mottled bird that creeps—or rather flashes—round and round a tree in search of larvæ. It is our one member of the family of Creepers. It is a little smaller than the English sparrow; is grayish-white beneath; the brown and gray above very like in coloring

BROWN CREEPER

to the bark of a tree; it has a slender, curving bill. It is a most diligent bird; it starts from the bottom of a tree and in a sort of spiral climb picks out with utmost care the larvæ in the bark. In climbing it sometimes uses its tail like the woodpecker, the tail being stiff and sharp at the points. The breeding-range is in the northern states and northward; from September to April it may be found from Massachusetts to Florida.

**Cre'ole.** See NEW ORLEANS.

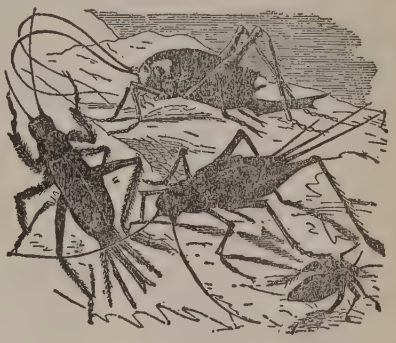
**Cress,** name of various plants whose leaves are an agreeable relish, much favored in salads. Garden-cress often called pepper-grass, is gaining ground in American gardens. In winter it may be grown in flower-pots or boxes, the seed sprouting very quickly; for a supply of tender leaves seed should be sown very frequently. Water-cress is an important market-crop. It can be grown in almost any pool or shallow water course with sand or gravel bottom, being introduced by scattering seeds or some freshly cut branches. It is a hardy perennial.

**Creston, Iowa,** a city, the seat of Union County, in the south of the state, on the Chic., Burl. and Quincy Railroad, 60 miles southwest of Des Moines. Besides its shipment of live-stock it has extensive railway-car works, machine-shops and wagon-factories. The city, which was settled so recently as 1868, is growing rapidly, and it has a fair showing of public buildings, besides schools and churches. Population 7,852.

**Crete** (*krēt*), a Turkish island in the Mediterranean. It is the southernmost portion of Europe, 160 miles in length and from 7 to 35 broad. The climate is fine, and the air fresh and bracing. Crete is quite mountainous, and its highest peak, Mount Ida, is 8,060 feet above the level of the sea. There are many harbors on the island: Suda Bay on the north is one of the best in the Mediterranean; and Fair Havens, in the south, is spoken of in *Acts*. Wheat and fruit, especially oranges and lemons, are mainly raised. Olive-oil, soap, nuts and the like are exported. Sponges are found on the coast. There are a few wild animals, but not a snake on the island. There are now only three towns of any size, though Vergil told of its "hundred cities." During the past quarter-century the remains of a great civilization have been discovered that equalled those of Egypt and Babylonia, and dates back 2,000 if not 3,000 years before Christ. Crete is now an autonomous Greek province, under Turkish suzerainty, though paying no taxes to Turkey; and its viceroy is always a native Greek Christian. The early Cretans were seafaring Greeks, the rivals of the Phœnicians. Its laws and its great lawgiver, Minos, were famous, as were also its bowmen; while a Cretan came everywhere to mean a liar. Rome, the Saracens, the Greek emperors, Venice and the Turks have in their day owned the island. Its area is 3,365 square miles; and its population is estimated at 310,815. Canea is the capital (population, 24,537).

**Crichton** (*krī'tăn*), **James,** called the Admirable Crichton was born Aug. 19, 1560, in Perthshire Scotland, and was educated at St. Andrews. After leaving the university he went to France. His swordplay and power as a debater on any subject with the professors of the Sorbonne are said to have astonished all Paris. At Venice the great printer Aldus was his friend. Here he spoke before the doge and senate, and is said to have astounded them with his eloquence and grace. Other encounters took place, in which, it is said, he made Latin poems on the spot, offered to carry on the debate in poetry, and performed like prodigies. Moreover, according to the story, he became tutor to the heir of the duke of Mantua. Here he killed a skillful duelist, and became so renowned that he was attacked one night by three masked men out of jealousy. Crichton's swordsmanship gave him the best of it, and to save his life the leader of the masks was forced to tell who he was. It was Crichton's prince-pupil. The tutor fell on his knee, and, presenting his sword, asked his pardon; but the prince basely ran him through the body. Crichton had a fine memory, is said to have been familiar with 12 languages, and was a good debater, but many of the stories of his prowess are probably fictitious. He perhaps fell in a night-brawl, but that it was his own pupil who dispatched him is unlikely. He died at Mantua, in 1583, or, according to others, some time between 1585 and 1591.

**Cricket,** an insect related to grasshoppers and locusts. There are three kinds—mole-crickets, true crickets and tree-crickets. The mole-crickets have their front limbs expanded and especially fitted for digging; they make burrows and lay their eggs in underground chambers. The true crickets are very abundant in the fields; they are black, sometimes with brownish wings. They usually feed on plants and lay their eggs in the ground in the autumn, the broods hatching out in the spring. To this division



CRICKETS

belong, also, the house-crickets. The chirping sound is produced by the males rubbing the file-like edges of the principal vein of their wing-covers upon a scraper located on the margin of the opposite wing-cover. The true wings are not involved in making the sound. The tree-crickets are delicate, whitish-green. They live on trees and shrubs, and often do damage by boring to deposit their eggs. One kind lays its eggs in stems of the raspberry. The katydid is not a cricket.

**Cricket** (*krĭk-ĕt*), the Englishman's national game the world over, is an outdoor game with balls, bats and wickets. It is played by 11 men on a side. Two wickets, each consisting of three uprights or stumps rising 27 inches above the ground and with two small pieces or bails on top of the uprights, are placed opposite each other, 22 yards apart. One eleven takes position in the field, the other goes to bat. The bowler of the first eleven stands almost behind one wicket, the wicket-keeper directly behind the other. Two players from the second eleven stand at the wickets, the first batsman in front of one, the second beside the other. The bowler rolls his ball at the opposite wicket, to knock it down or make the batter hit

the ball so that it will be caught on the fly and the batsman put out. The batter prevents the wicket from being hit, drives the ball far enough to give time for changing places with the other batter, and so makes runs. These continue so long as there is no risk of the stumps being hit while the batsmen are away from the wickets. If, however, the batter let the ball carry a bail or a stump away; or knock either down himself; or stop the ball with his body; or has the ball caught in the air—he is out. After five balls have been bowled, (sometimes four or six by arrangement), the eleven in the field changes to the same positions for the second wicket that it had for the first. Bowling at the second wicket continues for five balls, but by another bowler, and so it goes until ten men have batted. The eleventh is not out. This makes an inning, but, as a large number of runs may be made by a single batsman, it usually lasts more than a day. Then the other eleven comes to bat, and the first goes to the field. Two whole days at least are required for a first-class two-innings match. The game generally ends with a fourth inning, the eleven with the most runs being the winner. The rules of the Marylebone club (founded 1744) govern the game everywhere.

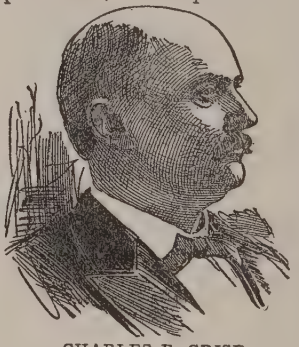
**Cricket on the Hearth, The,** is one of Dickens' Christmas-Books, and like the others is characterized by a whimsical, almost fantastic humor, while it presents in the most edifying fashion the contrast between greed, selfishness and cunning on the one hand and simple goodness of heart on the other. It is distinguished by a truly dramatic climax. A good husband, believing that his young wife loves another and blaming himself for the loss of her affection, is about to sacrifice his home for her sake, when, to the reader's great relief, the burden of sorrow is suddenly transferred to a despicable old fellow, who had hoped to win a pretty young bride by the power of his money. He loses his bride, but is so moved by the unselfish love of all around him that his own heart is renewed, and he joins happily in the marriage-festivities. The merry chirping of a cricket mingles with the song of the kettle to soften with its music the passions that at times threaten to destroy the peace of home.

**Crime'a** (the ancient *Chersonesus Taurica*), a peninsula of southern Russia, between the Black Sea and the Sea of Azov. It is about 125 miles from north to south and 200 from east to west, and has an area of about 10,000 square miles. It is joined to the mainland by the isthmus of Perekop. Balaklava and Sebastopol are its two chief harbors. The Crimea was once famous for its wheat, but of recent years the peninsula has suffered much from drought. Porphyry and coal are found. The Crimea's situation in the Black Sea, between Europe and Asia, has made it a tempting prize alike to Greek, Tartar, Turk and Russian.

The Crimean War (1853–56), fought in the peninsula, was caused by Russia's attempt to establish its protection and that of the Greek church over the Christian subjects of Turkey, who, like the Russians, are of the Greek church. Turkey was aided by France, England and Sardinia. The battles of the Alma, Tchernaya, Balaklava and Inkerman were fought, and the fall of the strongest fortress of the Russians, Sebastopol, brought an end to the war. By the treaty of peace Russia gave up all she had gained during the war. Population of the Crimea about 250,000 (80,000 Tartars, 130,000 Russians, 40,000 Greeks, Jews, Bulgarians and Germans).

**Cripple Creek, Col.,** a mining town, situated on the foothills of Pike's Peak, in El Paso County, Colorado. Gold was discovered in its vicinity about 1885, but it was not until 1891 or later that its rich mining-wealth attracted experts and the town began to develop. Its annual production of gold is estimated at about $10,000,000. The town in 1894 was the scene of a miner's strike, and in 1896 it was visited by a destructive fire; but in spite of these drawbacks it has grown apace. Population, 6,206.

**Crisp, Charles Frederick,** an American politician, and speaker of 52d and 53d Congress, was born at Sheffield, England, Jan. 29, 1845; and died at Atlanta, Ga., Oct. 23, 1896. In early life he settled with his parents in Georgia, and in 1861 entered the Confederate service, in which he rose to the rank of lieutenant and was captured by the Federal forces. After the war he studied law, and in 1872 was elected attorney-general of a judicial district of Georgia, and subsequently became judge of the superior court of the state. In 1882 he was returned as a member of Congress, and in 1892 and 1893 was speaker of the house. In politics he was a Democrat.



CHARLES F. CRISP

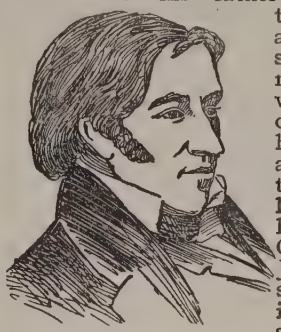
**Crispi** (*krĕs'pē*), **Francesco,** an Italian statesman, was born Oct. 4, 1819, at Ribera, Sicily, and became a lawyer at Naples. In 1848 he was one of the heads of the rising at Palermo, and for two years a leader of the Sicilians against Ferdinand I. In 1859 and 1860 he acted with Garibaldi in driving out

the Bourbons from Sicily. In 1877 he became a member of the national cabinet, and afterward was premier of the Italy he had helped to make. Here he took high rank among the statesmen of Europe. It is due to Crispi that Italy entered the Triple Alliance with Germany and Austria; and the policy of keeping up the army on a footing with other European states of the first rank and of building up a war-navy was mainly his. He died at Naples, Aug. 11, 1901.

**Crit'tenden, John Jordan,** was born in Woodford County, Ky., Sept. 10, 1787. He graduated at William and Mary College, Virginia, studied law, and became famous as a criminal lawyer. He served many times in the Kentucky legislature, was six times chosen senator of the United States, and served one term as representative in Congress and one term as governor of Kentucky. He also was attorney-general under Presidents Harrison and Fillmore. He was most prominent just before and during the Civil War. He opposed the repeal of the Missouri Compromise; in the Kansas troubles he sided against the course of Presidents Pierce and Buchanan; when Lincoln was elected he took firm ground for the Union; and in 1860 he proposed amendments to the constitution which, he thought, would allay strife. He strenuously sought to keep Kentucky in the Union, but was unwilling that slaves should be used as soldiers. He remained in public life to the close of his career, being in the midst of a campaign for re-election to Congress when he died near Frankfort, Ky., July 26, 1863.

**Crittenden, Thomas Leonidas,** son of the above, an American general, was born in Kentucky in 1819, and died on Staten Island, N. Y., Oct. 23, 1893. After studying law he became attorney-general in Kentucky in 1842, and from 1849 to 1853 was United States consul at Liverpool, England. Previous to this, he had served under Taylor in the Mexican War, and on the breaking out of the Civil War he entered the Union army, and was promoted to the rank of major-general and given command of a division of the Army of the Tennessee. Later, he served under Buell and Rosecrans, and at Chickamauga commanded one of the two corps that were routed. Resigning his commission in 1864, he entered the regular army two years later as colonel of the 32d infantry, and was brevetted brigadier-general in 1867. In 1869 he was transferred to the command of the 17th infantry and served on the frontier till 1876, and was in command of Governor's Island until he retired in 1881.

**Crock'ett, David,** was born at Limestone, Tenn., Aug. 17, 1786. Davy, as he was always called, was sent to school, but on the fourth day he quarreled with the schoolmaster, and, in fear of a thrashing both from his father and from his teacher, he ran away from home, spending his time roaming about with drovers and carriers. When 18, he came home, and for the first time learned his letters. In 1813 he served in the Creek War under Jackson. After serving in the legislature, he was sent to Congress for three terms. But, though at first a follower of Jackson, he had now become opposed to him, and, foreseeing defeat, he thought of starting upon a new career in Texas, which was then in revolt against Mexico. He had all his life been noted as a crack shot, a great hunter and a brave fighter. Here also, in Texas, he became famous for his exploits. He met his death after defending Fort Alamo against a large Mexican force. When only six men were left, the fort was captured, and the six, including Crockett, were shot by order of Santa Anna, March 6, 1836.



DAVID CROCKETT

**Crockett, Samuel Rutherford,** Scottish novelist, was born at Duchrae, Galloway, Sept. 24, 1860; and was educated at Edinburgh, Heidelberg and Oxford for the Scottish Free-Church ministry, which he entered in 1886, but afterward abandoned for literature. For a time he held a traveling tutorship at Oxford, and this enabled him to see Europe, Asia and Africa. His stories, however, deal chiefly with the homely characters and scenes of his native land. Scottish peasant-life has hardly ever, since the days of Scott and Galt, had so realistic and delightful a portrayer and delineator. He, moreover, draws much of his inspiration from his love of Scotland and of Scottish romantic and religious history. His novels, *The Raiders* and *The Men of the Moss-Hags,* admirably recreate the era of the Covenanters and their martyrdom for their stern faith. The first novel to bring Mr. Crockett fame was *The Stickit Minister,* published in 1893. Since then he has issued, among other works, *Sweetheart Travelers, Cleg Kelly* and *The White Plume of Navarre.* He died in 1915.

**Crocodile,** a large, well-known water-reptile covered with bony scales. The tail is long and crested. The name is properly applied to a number of animals living in Asia, Africa, Australia and America. The crocodile of the Nile is the most famous. It occurs in nearly all the rivers of Africa. It is said that, owing to the persecutions

of travelers, it is greatly reduced in numbers in the lower Nile, but it still is very abundant above the first cataract. This reptile is ordinarily 12 or 13 feet long; exceptional sizes are 18 and 20 feet in length. It seizes cattle and antelopes by the nose while drinking, and draws them into the water. Crocodiles devour dogs when they can catch them, and occasionally a child falls victim to the crocodile, but they rarely attack adults. On the whole they seem to prefer putrid flesh. They leave the water to bask on the mud-banks of rivers and marshes, and here they lay their eggs. From 20 to 60 eggs are inclosed in holes in the sand or mud, and left to be hatched by the heat of the sun. Associated with the crocodile is a bird, called the Nile-bird, that enters the mouth of the reptile while it is held open, and picks the leeches from the tongue and walls of the mouth-cavity. The gavials of India with long slender snouts belong to the crocodile group. The American crocodiles, living principally in South America and the West Indies, are now occasionally captured in Central America and the marshes of southern Florida. See ALLIGATOR.

CROCODILE

**Cro'cus.** A genus of the iris family, some of which are the earliest spring-flowers, but some bloom in the fall. The genus contains about 70 recognized species, and is native to southern Europe and southwestern Asia. The grass-like leaves and long tubular showy flowers rise directly from a subterranean corm. Numerous varieties are in cultivation.

**Crœsus** (*krē'sŭs*), king of Lydia, in Asia Minor, came to the throne about 568 B. C., when he was about 35 years old. The Greek cities of Asia Minor fell before his armies. He became wealthier than any ruler whom the Greeks knew, and "as rich as Crœsus" became a common saying. Solon, the Greek sage, once visited him. The king displayed all his treasures, and then asked the wise Greek who was the happiest man he had ever known. "Tellus of Athens," was the answer; "for he lived while his country was prosperous; he was surrounded with children and children's children, who were both beautiful and good; and he died upon the field of battle after having gained a gallant victory over the enemy." "And further," said Solon, "no man can be fully happy until a happy death has closed a happy life." And, in truth, Crœsus' wealth did not save him from misfortune. A son of whom he was very fond was accidentally killed in a boar-hunt. News came, too, that the Persian Cyrus, who had conquered right and left, had cast a longing eye on Lydia. Not knowing what to do, Crœsus asked advice of the famous oracle of Delphi. Said the oracle: "If Crœsus goes to war, he will destroy a mighty empire." What could be plainer? So off goes Crœsus, to be badly whipped by Cyrus, and to find that the empire he was to destroy was his own. When Sardis, his capital, was stormed, the king, careless of life, was about to be slain, when another son, who had been born dumb, scared into speech, told the Persian soldiers that it was the king, and he was kept for a worse death. Placed on a huge funeral-pyre, he watched the flames licking their way upward to their victim, and, thinking of what Solon had said about a happy death, he kept crying out: "O Solon! Solon!" Cyrus chanced to hear him, and, asking what he meant, was told the sage's warning, which made such an impression on him that Crœsus was rescued from the pyre, and became the conqueror's friend and guardian of his son and heir, Cambyses.

**Croly, Jane Cunningham,** American writer, known better by her pen-name of Jennie June, was born in Leicestershire, England, in 1831, and settled with her family, ten years later, at Poughkeepsie, N. Y. In 1857 she married D. G. Croly, a journalist, who died in 1889. From 1860 to 1887 she was editor of *Demorest's Magazine*, founded the Sorosis society, and took part in progressive movements on behalf of women. Subsequently she was elected to the chair of literature and journalism in Rutgers College and president of the New York City Women's Press club. Her books consist of a *History of Sorosis* and of the woman's club movement in America; *Talks on Women's Topics; For Better or Worse; Thrown upon Her Own Resources*, etc. She died on Dec. 23, 1901.

**Cromer, Evelyn Baring, first Earl of,** was born in Cromer Hall, Norfolk, on Feb. 26, 1841, and educated at the Royal Military Academy at Woolwich. He entered the Royal Artillery in 1858, and became captain in 1870 and major in 1876. After service in the colonies he was made private secretary to Lord Northbrook, while he was viceroy of India, from 1872 to 1876. He was commissioner of the Egyptian public debt in 1877-9, controller-general in Egypt, 1879, financial member of council of governor-general of India, 1880, and minister plenipotentiary, agent and consul-general in Egypt, 1883-1906. He was created baron in 1892, viscount in 1898 and earl in 1901, and was a privy councillor and a member of many orders of merit. He wrote several military works, paraphrases and translations from the Greek and a history of his Egyptian proconsulship. He virtually was king of Egypt, and his work there was constructive statesmanship

of the highest order. Egypt under him almost became another land. He died in 1917.

**Cromp'ton, Samuel,** was born at Firwood, Lancashire, England, Dec. 3, 1753, of poor parents. He educated himself, at the same time working as a cotton-spinner and playing the violin at the theater in the next town. In 1779 his spinning-mule was finished, after five years' labor, working at it even late at night. It spun yarn so wonderfully fine that his house was beset by persons eager to know the secret. Ladders were placed at the windows, and in almost every way the inquisitive tried to see it. He could not leave the house for fear his discovery would be stolen. All his savings had gone into the machine, and he had not a farthing left to secure a patent. In his misery he made known the working of the invention to a few manufacturers; from some he never got a cent, and in all he received but a beggarly $300. He managed, however, to start in business with the aid of friends, at first employing his own family as hands; but he was 60 years old before he received any return, when Parliament granted him $25,000. His mule came into use at once, and in 1811 there were in England 4,600,000 of them. He died near Bolton, England, June 26, 1827.

**Cromwell** (*krŏm'wĕl*), **Oliver,** Lord-Protector of the English Commonwealth and one of the most remarkable characters in English history, was born at Huntingdon, England, April 25, 1599. Little is known of his early life, except that he went to Cambridge. He had, however, but a short time for study, his father dying soon after he entered college, and he returned home to manage the family affairs. In 1628 he entered Parliament. When all hope of a reconciliation between Charles I and Parliament failed, Cromwell was among the first to offer to aid the state in defending its rights. He moved in Parliament for permission to raise two companies of volunteers, having been careful to supply the necessary arms beforehand at his own cost. He soon showed his wonderful military genius. He commanded the right wing of the Parliamentary army at Naseby (June, 1645), where the king's forces were utterly routed. Charles, in May, 1646, escaped in disguise, and surrendered himself to the Scottish army at Newark, by whom he was handed to the commissioners of Parliament. In January, 1649, the king was tried, condemned and executed. Cromwell was a prominent member of the new council of state. He crushed the rebellion in Ireland and in Scotland, and soon became the leading man in England. He dissolved the Long Parliament in 1653, and summoned a new one. The work of this parliament, which was dissolved in five months, gave Cromwell supreme power and the title of lord-protector. Cromwell repeatedly called and dismissed parliaments because he wanted the people themselves to govern and also wanted his government to be strictly constitutional, but his government was just and liberal toward the people and the country prospered under his rule. He died at Whitehall London, Sept. 3, 1658.

**Cronje** (*krŏn'yĕ*), **Piet,** a Boer commander in the war with Britain (1899-1901), was born in South Africa about 1835. He was a member of the Transvaal executive council, under President Paul Kruger, and in the raid of Jameson and his Uitlanders, in January, 1896, he brought about their surrender. He defeated Lord Methuen at Magersfontein, but afterward surrendered to Lord Roberts at Paardeberg, and was exiled to St. Helena. He has the reputation of being a fierce fighter and a resourceful commander.

**Cronstadt** (*krŏn'stät*), a strongly fortified seaport of Russia, is situated on the island of Koblan, near the head of the Gulf of Finland and 20 miles west of St. Petersburg. The island separates the approach to St. Petersburg into two channels, only one of which is navigable. This is narrow and strongly guarded by batteries. There are seven granite forts armed with heavy guns, and during the Crimean War Cronstadt was held to be impregnable. There are three harbors: the merchant harbor, which will hold 1,000 ships; the middle harbor, used for fitting vessels; and the war harbor, the regular anchorage for the Baltic-fleet section of the Russian navy. A large number of the people are sailors or workmen in the dock-yards. Cronstadt was founded by Peter the Great. Population, 59,939.

**Crook, George,** an American general, was born Sept. 8, 1828, near Dayton, Ohio. He graduated at West Point in 1852, and served on the frontier till the breaking out of the Civil War, in which he served with distinction, commanding a corps of Sheridan's army at the battles of Winchester, Opequan Creek and Cedar Creek. After the war he commanded in the west, becoming brigadier-general in 1873. His campaigns against the Pi Utes in 1872 and the Apaches in 1875 were ably fought. In 1882 he drove the Mormons and squatters from Indian lands, and brought the hostile Chiricahuas to terms. He was also concerned for the welfare of his Indian charges, among other reforms forcing the contractors to pay the Indians in cash for supplies instead of with store-orders. Under his management the tribes quickly became self-supporting. He died at Chicago on March 21, 1890.

GENERAL CROOK

**Crookes, Sir William,** an eminent English chemist and electrician, was born at London in 1832, and educated at the Royal College of Chemistry. In 1855 he became professor of chemistry at the Science Training College at Chester; in 1859 founded *The Chemical News;* and in 1864 became editor of the *Quarterly Journal of Science.* Subsequently he became a member of the council of the Royal Society, vice-president of the Chemical Society and prize-winner and gold-medalist of the French *Académie des Sciences.* His researches in physics and chemistry led in 1861 to his discovery of the metal thallium; of the sodium amalgam process for separating gold and silver from their ores; of other important discoveries in molecular physics and radiant matter; and to the invention of the radiometer and the otheoscope. In 1871 he published *Select Methods in Chemical Analysis;* subsequently *The Manufacture of Beet-Root Sugar in England; Handbook of Dyeing and Calico-Printing; Treatise on Metallurgy;* Wagner's *Chemical Technology;* Auerbach's *Anthracen and Its Derivatives;* Ville's *Artificial Manures;* with *The Profitable Disposal of Sewage* and *The Wheat Problem.* The latter consisted of an address delivered before the British Association in 1898. Dealing with physical research and the wheat problem, it created much interest and discussion. He is an authority on sanitation, and has studied spiritualism scientifically.

**Croquet,** a popular outdoor game, played on a grass lawn or levelled dirt-court under given rules. These rules, if adhered to and followed, and where the player is skilled in checkmating his own and his party's opponent, make a match well-nigh as interesting as a game of billiards, especially if all the players, who may be two or eight in number, are experts. The players, who are each furnished with a mallet and ball, are divided into pairs of partners, each playing alternately, the contest or feature of the game being to get one's ball from the starting point (the near stake), first through the various hoops (usually from 6 to 10 in number) placed upright in the ground in a defined order, to the farthest stake or goal, and back again.

**Cross, Mrs.** (Marian Evans). See ELIOT, GEORGE.

**Cross, Mrs. George Frederick** (Ada Cambridge), the novelist, was born at St. Germains, Norfolk, Nov. 21, 1844. Upon her marriage to the Rev. Mr. Cross in 1870 she sailed for Victoria, her home, with a sojourn in various bush-districts, until she settled at Williamstown in 1893. Mrs. Cross's published works include 15 or more volumes, from *My Guardian* (1877) to *Thirty Years in Australia.* (1903)

**Cross-Pollina'tion** (in plants), the transfer of pollen from the stamen to the stigma of another flower. See POLLINATION.

**Cross, Southern,** one of the star-groups in the southern heavens. Its right ascension is approximately 12 hours: its declination 60° south. The four main stars form a rough cross. It has been invisible from north of the latitude of Alexandria, Egypt, for 18 centuries. The Portuguese explorers of Africa about 1450 were the first modern Europeans to see it.

**Crow,** a bird of black plumage, belonging to the *Corvidæ* family, which includes jackdaws, ravens, rooks, bluejays and magpies. It is very extensive, embracing some 200 species, and its representatives are found in all parts of the world, except New Zealand, and sparingly in the Australian region. Six members of the family live in the eastern United States. The common American crow is abundant, is distributed generally in this country, and remains with us the entire year. In the winter crows assemble in great numbers in rookeries or crow-roosts. There are a number of these roosting-places in various parts of the country; the one on the Potomac near Washington is well-known. The number that assemble there at one time has been estimated at 40,000. The crows are usually considered to be destructive birds, but they do more good than harm. They injure cornfields to a considerable degree, but they also destroy many cutworms, beetles, grasshoppers, tent-caterpillars and other injurious insects, and thereby compensate for their own misdeeds. They also kill field-mice, rabbits and other rodents, follow the plow in the early spring, and eat the larvæ, field-mice and worms in the furrows. These wily birds soon lose all fear of the farmer's scarecrow, but remain suspicious of bits of bright tin swinging from cords stretched across a field, and they will not go near corn that has been dipped in tar. The birds are models of family affection; the male feeds his mate while she is on the nest, broods the eggs when she is absent, and stands guard with untiring zeal; and both parents long keep watch over their young.

**Crozier, John B.,** born in Ontario and educated at Galt and the University of Toronto, graduating in 1872. Soon after, he went to London, England, and commenced the practice of medicine. In 1880 appeared his *Religion of the Future,* a work of merit. In 1885 his *History of Intellectual Development* followed, and in 1887 he published *Lord Randolph Churchill.* His *Civilization and Progress* has reached a third edition.

**Cruikshank** (*krŏŏk'shănk*), **George,** an English cartoon-etcher, was born at London, Sept. 27, 1792. His father and elder brother were caricaturists. He thought of becoming an actor; but a publisher who saw some of his sketches talked him into illustrating children's books and songs. But he soon found that his genius lay in cartoons. His

finest etchings, perhaps, were those in *Peter Schlemihl*, Grimm's *German Popular Stories* and Dickens' *Oliver Twist*. His powerful series of *The Bottle* showed the evils of drunkenness in a strong light. He died on Feb. 1, 1878.

**Crusades, The** (from Portuguese *cruzado*, "marked with the cross"), is the name given to the religious wars carried on during the middle ages between the Christian nations of western Europe and the Mohammedans. The first of the crusades was undertaken (1096-9) to uphold the right of pilgrims to visit the Holy Sepulcher at Jerusalem. The Arabs had generously allowed the pilgrims, who came in thousands, not only to visit the sepulcher but to build a church and hospital in the city. In 1065 the Seljuk Turks conquered the country. At once the pilgrims were molested and treated with cruelty. Peter the Hermit, a Frenchman, who had himself made a pilgrimage and had witnessed the cruelties of the Turks, with the pope's sanction (1095) wandered over Europe, preaching everywhere to crowds in the open air, telling how Christians were beaten, robbed and murdered. Europe was roused from end to end. At a council, held at Clermont, France, to consider the matter, the pope's speech was interrupted by cries of "God wills it!" This became the war-cry of the enterprise; the badge worn was the cross, from which came the name crusade.

The following, in brief, comprises the annals of the various crusades: First, four rabble hordes went forth, viz., 20,000 under Walter the Penniless, followed by 40,000 under Peter the Hermit, who were badly cut to pieces in Bulgaria and the survivors utterly overthrown by the Turks at Nicæa; then issued 15,000 Germans who were scattered and slaughtered in Hungary, which also proved the grave of 200,000 poor wretches from England, France, Flanders and Lorraine. But soon came six armies of real crusaders under Godfrey of Bouillon, Robert, Duke of Normandy and others, accompanied by Tancred, the hero of the crusade; in all some 600,000. The sultan's capital, Nicæa, fell in 1097. Next Edessa, and then Antioch after a fearful siege of seven months, the Christian army melting away from famine, sickness and desertion. Two hundred thousand Seljuks now besieged the westerners. When they were routed, only 400,000 men were left to march on Jerusalem. The city fell; Godfrey of Bouillon was chosen king; soon all Palestine came into his hands; and for 50 years the crusaders held the principalities of Edessa, Antioch and Jerusalem. At Jerusalem were founded the two famous orders of the Knights Hospitalers of St. John and the Knights Templars.

In 1144 Edessa was conquered and the Christians slaughtered. A second crusade, preached by the famous St. Bernard, was led in 1147 by Conrad III of Germany and Louis VII of France. About 1,200,000 soldiers marched under them, only to be defeated, Conrad's army, by the treachery of the Greek emperor, near Iconium, and Louis' army in the Pisidian Mountains.

The deathblow to the kingdom of Jerusalem came from a young Kurdish chief, who had made himself sultan of Egypt and sought to become sovereign of all the Moslems—the famous Saladin. His conquest of Jerusalem (1187) gave rise to the third crusade, led by Philippe Auguste, king of France and Richard the Lion-heart, king of England. Acre was attacked (1190), and 23 months later it surrendered. But the leaders quarreled, Philippe went back to France, and Richard, after performing prodigies of valor, which excited the admiration of the Saracens, made a treaty with Saladin (1192), by which the people of the west were to be at liberty to make pilgrimages to Jerusalem without being taxed. The fourth crusade (1203) never went near Palestine, but founded the Latin Empire of Constantinople, which lasted 56 years.

One of the strangest happenings in history is the children's crusade, which took place in 1212. An army of French children, 30,000 strong, headed by a peasant-boy named Stephen, set out for the Holy Land by way of Marseilles. A like army of German children, 20,000 strong, led by a boy named Nicholas, crossed the Alps at Mont Cenis. A second army of German children, numbering nearly 20,000, crossed the Alps by a more easterly route, touching the sea at Brindisi. Their idea was that the Mediterranean would open a path for them to Palestine and that Jerusalem would be recovered and the Moslems made Christians by miracles. Some of the children became discouraged and returned to their homes, many stopped by the way, but most of them either perished on the march, or were lost at sea or sold into slavery.

The fifth crusade (1228) made Frederick II of Germany and Sicily, king of Jerusalem. In 1244 a new horde of Turks made themselves masters of Jerusalem. A sixth crusade (1249) followed, led by Louis IX of France, against Egypt, now held to be the key to Palestine. Louis was taken prisoner, and had to pay a heavy ransom. The seventh crusade (1270) was led by him and by Prince Edward, afterward Edward I of England. Nothing was accomplished by this adventure, however. Acre, Antioch, and Tripoli were held by the Templars and other knights for some time; but Acre, followed by the others, surrendered in 1291.

**Crustacea** (*krŭs-tā'shê-ă*), the name of a class of animals embracing the shrimps, prawns, crayfish, lobsters and a number of minute forms called water-fleas. They belong to a larger group or subkingdom (*Ar-*

*thropoda*) which, besides the crustacea, includes the insects, myriapods and spiders. These four are all *classes* of the great subkingdom *Arthropoda*, and therefore are equivalent groups. The crustacea pass through a metamorphosis, hatching from the egg in a different condition from the adult. Most of them live in the water and breathe by gills, but there are some terrestrial forms, like the pill-bug, which is to be found in dark places, under boards, under bark, in cellars. Some of the minute forms, called water-fleas, carry their eggs in cases attached to the body.

**Cryp'togams.** A name applied to all those plants which do not produce seeds, including therefore *Pteridophytes* (ferns, etc.), *Bryophytes* (mosses, etc.) and *Thallophytes* (*Algæ* and *Fungi*). The name was given under the impression that the sexual reproduction was hidden or obscure, when in fact it is more evident than in the seed-plants (*Spermatophytes*), which were called phanerogams, meaning "evident sexual reproduction." The mistake arose from the false idea that the stamens and pistils of flowering plants are sex-organs. The name *Cryptogam*, however, is convenient, although meaningless. Since the *Pteridophytes* have woody vessels, they are often called vascular *Cryptogams*, to distinguish them from *Bryophytes* and *Thallophytes*, which are *Cryptogams* without woody vessels.

**Cuba,** formerly a Spanish colony and called the Queen of the Antilles, is the largest island of the West Indies. It lies at the entrance of the Gulf of Mexico, between the Straits of Florida and the Caribbean Sea, with Haiti and Santo Domingo immediately east of it and the British island of Jamaica to the south. It is 730 miles long, and on the average 80 miles wide, with an area of 44,164 square miles. There are many good harbors, that of Havana being one of the largest and finest in the world. On the southeast are mountains, the tallest peak, Pico de Tarquino, rising 7,670 feet. Only in the province of Oriente are the mountains formidable or unavailable for cultivation. Mineral water and caverns in which are beautiful stalactites abound. No month is free from rain, but the temperature does not materially differ from that of Florida, though frosts are unknown. Earthquakes in the east are frequent, and the island is sometimes swept by hurricanes, one of which in 1846 destroyed 216 vessels and 1,872 houses. In natural resources Cuba is far the richest of the Antilles, and could support over 15,000,000 people. The soil is exceptionally rich, easily worked and capable of the greatest degree of tillage. Some localities are rich in minerals, as asphalt, copper, iron and lead. Native plants number over 3,350. Virgin forests contain immense quantities of many varieties of valuable timber. There are no venomous snakes nor dangerous wild beasts. Tobacco, coffee, cotton and fruits are raised; but the great crop and export is sugar. Cuba depends wholly upon agriculture for its prosperity, the sole manufactures being cigars and sugar. The main trade is with the United States, and the reciprocity-treaty made in 1891 has increased the trade between the two countries. The cultivation of oranges and potatoes for export is growing, the Cuban potato equalling that of Bermuda. The capital is Havana, which has a university. (Population over 300,000.) The other cities are Santiago de Cuba, Matanzas, Cienfuegos, Puerto Principe and Cardenas. The larger cities are mostly on the coast, a fact that indicates their commercial character. Five or six railways are in operation, and nearly as many more are being built. The island is divided into six provinces or political divisions, which since 1898 have been in considerable social, commercial and political disorganization. This was restored to some semblance of order under the excellent administration of the United States governor-general, Leonard Wood. Cuba was the most important colony of Spain, and was ruled by a captain-general. Columbus discovered the island in 1492, and said it "was the most beautiful land that eyes ever beheld." From 1868 to 1878 Cuba was in a state of revolution, which greatly retarded its growth. Its many slaves were freed in 1878. Population, 2,150,112. As native whites form 59% of the population, colored people 32% and foreign whites 9%, their numbers would seem to be 1,166,402 Spaniards and Creoles, 649,050 negroes and mulattoes, 15,000 Chinese coolies and 182,545 foreign whites. Immigration has increased rapidly. In 1902 the immigrants numbered 11,000, but in 1905 they were over 54,000 in number, excluding 6,000 colonists or settlers from the United States.

The later history of the island may be briefly told. In 1895 the Cubans again revolted, claiming that the treaty of 1878 had never been kept in good faith; that, while names and forms had been changed, the tyrannical and oppressive policy of Spain had been continued. After desultory outbreaks in different provinces, a Cuban force of 10,000 men was organized under Maximo Gomez and Antonio Maceo, both of whom had been leaders in the former revolt (1868-78). For three years the war raged, marked by desperate bravery as well as by most cruel atrocities and the devastation of the island by fire and sword, without decisive results.

The cruelties practiced by the Spaniards upon the Cubans, including innocent women and children, excited universal horror, and led to repeated protests on the part of the United States government. Spanish hatred

of the United States was thus engendered, which reached a climax when the United States battleship *Maine*, on a friendly visit in the harbor of Havana, was destroyed by a submarine mine on Feb. 15, 1898. Hostile action quickly followed, and war between Spain and the United States was declared on April 24. On July 3 the American fleet under Admiral Sampson destroyed Spain's strongest fleet off Santiago. Meanwhile Santiago was besieged by the United States forces under General Shafter. A fierce battle was fought on July 1, and on July 17 the Spanish general surrendered with his army of 25,000 men. Peace negotiations followed, and by treaty signed on Dec. 10, 1898, Spain surrendered all sovereignty over Cuba, and ceded Porto Rico to the United States. On Dec. 28th the United States formally took the island over for military occupation temporarily. It was the declared policy of the United States to promote the independence of Cuba and surrender all jurisdiction in the island so soon as a firm and stable government should be established. To this end, under military occupation of the island, the United States proceeded to establish order, organized civil and municipal governments, established schools throughout the island and provided for a convention of the people, under which a constitution was formed and the Republic of Cuba established. On May 20, 1902, the authority of the United States was withdrawn, and on the same day Tomas Estrada Palma, who had been elected president of the republic, was inaugurated. Four years later he was re-elected, but gross frauds were charged, disaffection spread and in September of 1906 the island was swept with a whirlwind of revolution. The government was helpless. President Palma called upon the United States to intervene as provided by treaty, and resigned his office, the insurgents acquiesced and laid down their arms, and for a second time the United States assumed temporary jurisdiction of the island and established a provisional government. After administering the island for two years, during which many reforms were inaugurated and public tranquillity was restored, the provisional government caused a popular election to be held in December, 1908. This resulted in the election of a new government with José Miguel Gomez as President. This new government was duly inaugurated and in February, 1909, the authority of the United States was finally withdrawn and the Republic of Cuba was again established.

**Cuckoo,** a bird named from its *coo coo* cry, found both in the Old and the New World. The European cuckoos have the habit of laying their eggs in the nests of other birds—usually smaller birds than themselves. But this habit is not common to all members of the group, for a number of the cuckoos make nests. The two forms common in the northeastern United States are the yellow-billed and the black-billed cuckoos, birds with noticeably long tails, of an olive-brown color above and white below. They make a loose nest of twigs, and lay four or five eggs of a pale, greenish color. They destroy many injurious caterpillars, and one writer suggests they might well be called the caterpillar-bird. They are shy birds, and the call of the rain-crow, as they are commonly called, is better known than the bird itself. It is a series of *tut-tuts*, followed by *cl-uck-chucks*, and then a loud *cow-cow-cow*.

BLACK-BILLED CUCKOO.

**Cu'cumber.** See CUCUMIS.

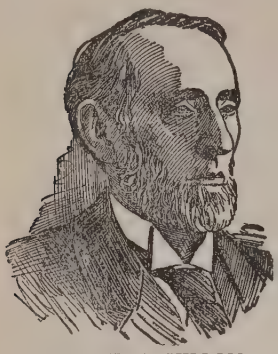
**Cu'cumis.** A genus of plants of the gourd family, to which belong the various forms of muskmelons and cucumbers. It belongs to the tropics and contains about 30 species, mostly in Africa and the East Indies. The numerous forms of muskmelon, cantaloupe, etc. are forms of the *C. Melo* from southern Asia. The cucumbers are forms of *C. Sativus*, also from southern Asia.

**Cul'berson, Charles A.** (1855–), governor of Texas and U. S. senator, born in Alabama, and moved with his parents in 1858 to Gilmer, Texas, and later to Jefferson and to Dallas. After studying law he practiced that profession, and in 1890 became attorney-general of the state, and subsequently governor. In 1899 he was elected U. S. senator, and was re-elected in 1905.

**Culloden** (*kŭl-lōd'en*), a tract of moorland, about five miles from Inverness, Scotland. Here, April 16, 1746, was fought a battle which put an end forever to the hope of the Stuarts of regaining the English throne. The Duke of Cumberland, with his artillery and disciplined troops, was more than a match for Charles Edward, the young Pretender, whose little army of Highlanders were worn out by a night march, and were half-starving and broken by desertion. After a desperate and bloody attack, the English stood firm and the Highlanders broke and fled.

**Cullom, Shelby Moore,** United States senator and Republican governor of Illinois (1876–83), was born in Wayne County, Ky., Nov. 22, 1829. In 1830 he removed with his parents to Illinois, and studied law and practiced at Springfield, where he had his home. In 1856 he was elected to the Illinois legislature, and in 1860 was speaker of the chamber. From 1865 to 1871 he represented his district in Congress, when he

re-entered the Illinois legislature and once more became speaker. In 1876 and again in 1880 he was governor of his state, but resigned in 1883 to become United States senator. He remained in the senate continuously after that date, being re-elected successively in 1889, 1895, 1901 and 1907. Senator Cullom nominated Grant for the presidency in 1872 and always took an active part in railroad legislation. In 1886 he was chairman of the Interstate Commerce Commission, later chairman of the committee on foreign relations; and in 1898 was appointed one of the commissioners to establish United States government in Hawaii. He died January 28, 1914.



SHELBY M. CULLOM

**Culpeper** or **Colepeper, Thomas, Lord,** colonial governor of Virginia (1680–83), was born in England in 1664 and died there in 1719. In 1669 he purchased lands in Virginia lying between the Potomac and the Rappahannock, and in 1673, with Lord Arlington, received from King Charles II a grant of the whole territory of Virginia. Later on he was appointed governor of the province, and personally ruled there between the years 1680–83, and acted despotically, annulling the privilege of appeal of the colonists to the local assembly. In 1683 he withdrew from his governorship, and in violation of orders returned to England, where he was deprived of his patent as governor and prosecuted. At his death his large estate in Virginia passed to Lady Fairfax, his daughter.

**Cumberland, Md.,** the county-seat of Allegany County, on the north bank of the Potomac at the mouth of Wills Creek and the western terminus of the Chesapeake and Ohio Canal. It lies about equidistant from Pittsburg, Pa., and Baltimore, Md., and is the seat of an extensive coal-trade from the semi-bituminous coal-seams of the region. It also has many industries, including those for the manufacture of steel, iron, glassware, besides foundries, machine and repair shops, flour, cement, silk-mills, etc. It has a number of good public grammar-schools, a public high-school and an academy. Population, 27,000.

**Cumberland Mountains** are a part of the great Appalachian group, running along the southwest border of Virginia and the southeast border of Kentucky, crossing Tennessee into the northeastern part of Alabama. The ridges rarely are over 2,000 feet high, while the range is about 50 miles broad. It is the southwestern extension of the Alleghanies, and sometimes is called the Cumberland Mountain-plain.

**Cumberland River** rises in Kentucky, flows into Tennessee and, coming back to Kentucky, enters the Ohio after a course of about 650 miles. Nearly 600 miles to Burnside are navigable for steamboats. Near Williamsburg, Ky., there is a fall of 60 feet.

**Cumberland, R. I.,** a town in Providence County, six miles from the city of Providence. It manufactures cotton-goods and iron-wares, and has the service of the New York, New Haven and Hartford Railroad. Population, 10,107.

**Cumberland Road,** an early highway, constructed by the national government to connect Cumberland, Md., on the Potomac, with the Ohio River, an undertaking of much importance in opening up the west and southwest to the east before the era of railways. The project was begun about 1806, and was completed as far as Illinois about 1838, at a total cost to the federal government of close upon $7,000,000. Under the name of the Great National Pike the road was held under national control; but in 1856 it was turned over to the several states through which it passed. In his day Henry Clay was influential in obtaining the necessary sums from the nation to construct the road.

**Cuneiform** (*kū-nē'i-fôrm*), a form of writing in which the parts comprising it are like a wedge or arrow-head. It was used by the ancient peoples of Akkad, Babylonia, Assyria, Armenia, Elam and Persia, and was cut upon stone, bronze, iron, glass and clay in the shape usually of columns, bricks or cylinders. It was used from about 3800 B. C. until after the era of the birth of Christ. The cuneiform signs were first pictures of objects, a circle, for example, standing for the sun; but little by little these signs became so changed that there was no resemblance to the object it stood for. For 1,600 years after the writing ceased to be used, its meaning was wholly lost sight of, nor for a long time was it known that it was writing at all. One so-called authority deemed the writings only the idle fancies of the architect, who had tried to see how many arrowheads and other strokes could be cut on a brick. Another supposed them the work of worms. A third thought them charms, which, if they could be read, would open huge vaults of gold and pearls. A fourth great scholar held that they were in the unknown language by which the Almighty had talked to Adam. The translating of these wedges is a triumph, by the side of which the reading of a modern cipher is child-play. Many scholars have gained name and fame by

merely spelling out a few letters. These inscriptions are found to be mostly histories of reigns. For example, the great Behistun inscription gives an account of the reign of Darius Hystaspes, king of Persia, enumerating lists of his ancestors, a description of the extent of his power, the main events of his reign, the palaces he built and his prayers. Cuneiform inscriptions are of the first importance in the light they throw on those great early eastern empires and on facts mentioned and referred to in the Bible.

**Cu'pid,** called also Amor, the Latin name for the Greek god Eros, is the god of love and the son of Venus. He appears as a boy, playful and mischievous, with bow and arrow, and sometimes with torch, quiver and wings. His eyes are often covered so that he shoots blindly. His darts were said to pierce the fish at the bottom of the sea, the birds in the air and even the gods in Olympus. Praxiteles' statue of Cupid is famous as a representation of the god.

**Cu'pule** (in plants), the peculiar involucre which invests the nuts of the oak, beech, chestnut, etc. The bracts of the involucre coalesce, and in the acorn form a cup-like structure. The name is also applied to cup-like structures which appear on the bodies of certain liverworts, as Marchantia, and which contain the peculiar reproductive bodies called gemmæ.

**Curaçao** (*kōō-rä-sō'*) is the most important of the Dutch West Indies. It is situated about 40 miles from Venezuela, and is about 40 miles long by 10 broad, covering an area of 210 square miles. The chief product is salt. From the peel of the Curaçao orange is made, in Holland, the Curaçao liqueur. The capital, Willemstad, is the headquarters of the government of the Dutch West Indies, including besides Curaçao, Aruba, Bonaire, St. Eustache, Saba and the Dutch part of St. Martin, with a population of 53,486. The trade is mainly with the United States, and consists of maize, beans, pulse, salt and phosphate of lime, besides cattle. Curaçao was discovered by the Spaniards in 1527, was taken by the Dutch in 1634, conquered by the English in 1798 and again in 1806, and restored to Holland in 1814. Population, 31,587.

**Curculio.** See AVERIL.

**Curfew.** See BELL.

**Curie** (*kü-rē*) **Pierre** (1859–1906), joint discoverer with his wife, Madame Sklodowska Curie (1867), of radium. Mons. Curie, son of a noted metallurgist near Paris, was himself professor of physics and chemistry at the Sorbonne, and for many years pursued laborious investigations as to the radial activity of metallic uranium. In this he was substantially assisted by his talented wife, a Pole, who had herself discovered a new metal, which she named polonium. Jointly, while continuing their investigations, they succeeded in separating radium from the barium extracted from several tons of pitchblende, and for this they were rewarded by the Royal Society of London, which body conferred upon the Curies (husband and wife) the Sir Humphrey Davy gold medal. In April, 1906, M. Curie was accidentally run over by a wagon and killed in the streets of Paris. The discovery of the Curies is admittedly a momentous one, since it is possible by it to explain some of the grave riddles of the universe, especially such as have to do with heat-radiation, without combustion or chemical change and without any appreciable increase in its energy.

**Curling,** a winter outdoor game played with round, flattened stones furnished with a handle (the stones being about 36 inches in circumference) on an ice-rink. It is a familiar game in Scotland, and is now played more or less extensively in the United States and Canada. The game consists in playing four on a side in matches (each player having two stones) from a tee at one end of the rink, marked by a circle, to a tee at the far end, 40 yards apart—the object being to plant the stone near to the far tee and to guard it there, as well as to drive out the stone of an opponent. The weight of stone and handle is usually about 50 pounds; and each player makes use of a broom to clean the ice of any snow or impeding obstacles that may prevent the stone of a player, on one's own side, reaching the tee or striking aside an adversary's stone. Around each tee is a circle of seven feet radius, called the home or ring, while behind the near tee and beyond the far one are 12 feet spaces, divided into "back-scores." Between the two tees (114 feet apart) is a middle score line; while at either end (21 feet from each tee) is an intervening line called the hog-score. Two leaders called skips command the opposing teams and have the management of the game, each for his own side. The highest possible score in the game is 72. Curling is a most healthful, manly game, and has the positive advantage of having little or no betting attached to it.

**Cur'ran, John Philpot,** a famous Irish orator, was born on July 24, 1750, at Newmarket, Ireland. He was idle and reckless, both while at school and at Trinity College, Dublin. While studying law in London, he had his earliest practice in speaking at the students' debating societies. On his first rising in court, he was so nervous that he could hardly read the few words of a legal form, and, when told by the judge to read more clearly, he could not go on at all. But he soon conquered this, and his wit and eloquence made him famous throughout Ireland. He became a member of the Irish house of commons, was supporter of Grattan, and, though a Protestant

himself, had a warm sympathy with his suffering Catholic countrymen, and spoke eloquently in favor of the government's changing the policy of oppression which was driving them into rebellion. Curran's chief fame came from his speeches in court in behalf of the leaders of the rebellion of 1798, which made him beloved by the whole country. The union of Ireland with Great Britain that followed, Curran opposed as the destruction of his country. His health broken, deserted by his wife, his daughter dead of a broken heart soon after the execution of her lover, Robert Emmet, Curran drudged through eight years as master of the rolls. His last three years were spent in London, where his life was brightened somewhat by the brilliant society of Sheridan, Erskine and Thomas Moore. Curran's little figure, ugly face, bright, black eyes and great vivacity easily marked him out from all others, and his wit, sharpness and brilliant flow of language have hardly ever been equaled. He died Oct. 14, 1817.

**Cur'rant.** Species of the genus *Ribes*, which belongs to the saxifrage family. Associated with the currants in the genus are the gooseberries. The genus contains numerous species which are widely scattered, many of them being native to North America. Four species are cultivated in American gardens. *R. rubrum* includes the red and white varieties, and is found wild in both Europe and North America. *R. nigrum* is the European black currant. *R. Americanum* (*R. floridum*) is the American black currant, very similar to the European form. *R. aureum*, the Missouri or Buffalo currant with spicy, yellow flowers, is usually grown as an ornamental shrub, being native to western North America.

**Currency Law.** President Wilson, in signing the measure known as the Glass-Owen Currency Bill, Dec. 23, 1913, defined its purpose: "To furnish the machinery for free, elastic and uncontrolled credits."

*A "United States" of Banks.* This law brings the banks of the United States into co-operation with the Government and with one another in a system corresponding to that of the Union itself—with its central and state governments and the sub-divisions of the latter.

*Need for "A More Perfect Union."* Business transactions are mainly based, not upon money, but upon credit. Credit is based not alone upon money and other assets but upon confidence in "the business situation;" so that the mere existence of a banking federation to provide for financial needs and emergencies not only supplies those needs but has a strong tendency to prevent panics and depressions.

The law provides for broadening the basis of credits: (a) By permitting banks to re-discount at Federal Reserve Banks under Government control, the paper which they, themselves, have received as security for loans; (b) by including as lawful security paper issued for industrial and commercial purposes, and paper maturing in six months, secured by agricultural products. National banks, except those in the Central Reserve cities of New York, Chicago and St. Louis, may also make direct loans on five year farm mortgages; (c) by allowing member banks to accept bills of exchange at not more than six months sight drawn against imported or exported goods; (d) by permitting or compelling one Federal Bank to loan to another on discounted paper; (e) by providing for printing, by the Government when needed, of Treasury Notes to be issued by these Reserve Banks and secured by the re-discounted paper referred to under (b). The Reserve Bank is also required to hold in gold 40% of the value of these notes and they are guaranteed by the Government and redeemable in gold. In times of unusual demand for money, the Government may temporarily suspend the gold reserve provision.

The leading features of the law, as effecting the borrower and business conditions, may be summarized as follows:

The country is divided into districts in each of which the Government locates a Federal Reserve Bank. All national banks in each district must, and any state bank in the district may, under certain requirements, take stock in this bank equal to 6% of capital and surplus. Federal banks can loan only to their stockholders or "member banks." Their sources of profit are interest on these loans and profits on dealings in designated securities. Dividends are restricted to 6%, earnings above 6% (and surplus fund requirements) going into the United States Treasury.

A very close control of this banking federation is vested in a Federal Reserve Board at Washington, consisting of seven members (one of whom must be Secretary, and another Comptroller of the Treasury) appointed by the President with consent of the Senate.

*Powers*: Of the nine directors of each Federal Bank, the Board appoints three, one of whom acts also as the "Federal Reserve Agent" through whom the Board and the Federal Banks communicate with each other; can remove directors of Federal Banks; in emergency, in its judgement, can suspend restrictions as to Federal Bank reserve; decides as to renewal of loans by Federal Banks and rate of interest to be charged from time to time on the Treasury notes and on loans.

To prevent the over-loaning of money for undue expansion and other dangerous and speculative ventures there are, in addition to the control provided by the close articulation of the Government and the banks, these checks upon inflation: (a) The fact that the Secretary of the Treasury can withdraw Government funds from a Federal Bank, thus reducing the basis of loans; (b) the fact that Member Banks must pay interest on borrowed money; (c) the fact that one Federal Bank cannot, under penalty of a heavy tax, re-issue the Treasury notes of another Federal Bank; (d) although the Board may suspend the gold reserve provisions in times of unusual demand for money, a heavy tax, the amount of which is in the discretion of the Board, may be imposed on the Treasury notes when the Reserve falls below the 40% required under the law. (See BANKS, MONEY, MINT.)

**Curry, Jabez Lamar Monroe** (1825-1903), American educator, lawyer and minister, was born in Lincoln County, Georgia. He was a member of the Confederate Congress. After the war he became a minister, and later professor of law at Richmond College. For four years (1881-85), he acted as general agent of the Peabody Educational Fund and later was chairman of the Educational Committee of the Slater Fund. From 1885 to 1888 he represented the U. S. as minister at Madrid. His published writings embrace a treatise on *Constitutional Government in Spain*, a memoir of *William Ewart Gladstone* and a work, issued in 1894, on *The Southern States of the American Union*. Besides a *History of the Peabody Educational Fund*, he wrote a work on *Establishment and Disestablishment in the United States*.

**Curtis, George Ticknor,** American writer on legal topics, was born at Watertown, Mass., Nov. 28, 1812; and died at New York, March 28, 1894. Graduating at Harvard in 1832, he studied law and was admitted to the bar, practicing first at Boston and later at New York. He served for some years in the Massachusetts legislature, but at length devoted himself to the writing of legal text-books and the compilation of decisions in the courts of common law and admiralty in the United States. One of his most notable works is his *History of the Origin, Formation and Adoption of the Constitution*. Another useful work is his *Constitutional History of the United States from* 1792–1864. He also wrote lives of Daniel Webster and James Buchanan.

**Cur'tis, George William,** American author, was born in Providence, R. I., Feb. 24, 1824. As a boy he spent a year in New York as a clerk, and worked for some time as a farm-hand in Massachusetts. His first book, *Nile Notes of a Howadji*, was written after traveling in Egypt and Syria. He was one of the first editors of *Putnam's Monthly*, founded in 1852. He also was a partner in the undertaking, though having nothing to do with the business management. When, in 1859, the enterprise failed, Mr. Curtis sank all his fortune in the endeavor to save the creditors from loss, which he accomplished after six years' struggle. He wrote many essays, sketches and novels, and was successful as a lecturer. He is best known as the editor of *Harper's Weekly* and editor of the *Easy Chair* in *Harper's Magazine*. Mr. Curtis was prominent in politics, acting with the Republican party till 1884, but afterward supporting the Democrats. He died on Staten Island, N. Y., Aug. 31, 1892.

**Curtius** (*kŏŏr'tê-ŏŏs*), **Ernst,** was born Sept. 2, 1814, at Lübeck, Germany. He studied at Bonn, Göttingen and Berlin Universities. He made careful journeys in Greece, held several university professorships, and soon became noted as a writer on Greek history and geography. His great work, *The History of Greece*, is in the front rank of histories. Dr. Curtius was, late in life, professor at the University of Berlin. He died on July 12, 1896.

**Curwen, John** (1816–1880). Originator of the Tonic Sol-fa method of teaching singing. He was educated for the ministry at University College, London, but became author of *Grammar of Vocal Music; A Tonic Sol-fa Primer; Musical Theory; Musical Statics;* and other useful works.

**Cur'zon, George Nathaniel, Lord,** ex-viceroy and governor-general of British India, was born at Kedleston Hall, Derbyshire, England, on Jan. 11, 1859, and educated at Eton and at Balliol College, Oxford. He entered Parliament in the Conservative interest in 1886, and was subsequently under-secretary of state for India and under-secretary for foreign affairs. Lord Curzon has traveled considerably and published a number of thoughtful books. In 1895 he married the eldest daughter of Mr. L. Z. Leiter, a Chicago millionaire. In 1898 he was appointed by the Marquis of Salisbury, Viceroy of India, a post which he has filled with high ability. His writings include *Russia in Central Asia; Persia and the Persian Question;* and *Problems of the Far East*. In 1898 he was created Baron Curzon of Kedleston. His term of office as Indian Viceroy was extended. In June, 1905, difficulties over the new military scheme in India led to his resigning. The resignation was withdrawn upon solicitation of home-authorities, but in August controversy again reached an acute stage, and Lord Curzon finally relinquished office. He remained in India to receive the Prince and Princess of Wales. The London *Times* spoke of his work as "among the most brilliant and strenuous accomplished for the empire in our times," and of his having infused into Indian civil administration a new spirit born of his own indomitable belief in reform and his own unshaken determination to carry it into practice. His speeches as Viceroy have been reprinted. Since his return to England he has been returned from an Irish constituency to the House of Lords, of which body, as a peer, he is already officially a member.

**Cushing, Caleb,** American diplomatist and jurist, was born at Salisbury, Mass., Jan. 17, 1800; and died at Newburyport, Mass., Jan. 2, 1879. After graduating at Harvard, he studied law, traveled in Europe, was a member of the Massachusetts legislature, and finally became a member of Congress. He served for eight years in the house, and in 1843–44 was United States commissioner to China. From 1845 to 1847 he

served in the Mexican War, and was raised to the rank of brigadier-general. In 1852 he was appointed associate-justice of the supreme court of Massachusetts, and in the following year became United States attorney-general. In 1871-72 he acted as counsel at the tribunal of arbitration in Geneva; and from 1874 to 1877 was United States minister to Spain. Mr. Cushing published a number of works; but his chief publication was an account of *The Treaty of Washington* (1873).

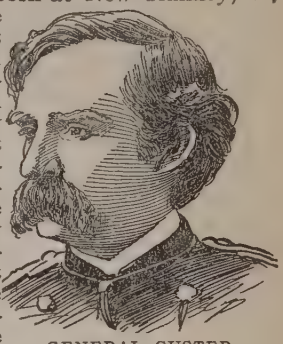
CALEB CUSHING

**Cushing, William Barker,** American naval officer, whose distinguished service was the destruction of the Confederate iron-clad *Albemarle*, was born in Wisconsin in 1842; and died at Washington, D. C., Dec. 17, 1874. He entered the Naval Academy in 1857, and in 1861, before graduating, he joined the United States navy and served throughout the Civil War. His most noted act occurred Oct. 27, 1864, at Plymouth, N. C., when, with a volunteer crew on a steam-launch and amid the hot fire of Confederate guns, he approached the Confederate ram, *Albemarle*, and fired a torpedo under her, which destroyed the iron-clad, along with his own launch. Cushing and some of his men swam ashore and escaped. For his gallantry the young hero was officially thanked by Congress, and in 1872 was advanced to the rank of commander. He died at the national capital two years later.

**Cush'man, Charlotte Saunders,** an American actress, was born at Boston in 1816. Her father became bankrupt and she helped to support the family when only 12 years old. She sang in concerts and made her first appearance in opera at Boston, in 1835, but soon after that lost her fine contralto voice. Not discouraged, by any means, she at once fitted herself to become an actress. Her appearance in New York as Lady Macbeth was a success. She afterward acted with Macready, and also gained fame in England. Miss Cushman died at Boston, Feb. 8, 1876.

CHARLOTTE CUSHMAN

**Cus'ter, George Armstrong,** an American general, was born at New Rumley, O., Dec. 5, 1839. He graduated at West Point in 1861, and as second lieutenant of United States cavalry made his first charge at Manassas, driving a Confederate force across Muddy Creek. As assistant-engineer at Yorktown, he planned the earthworks nearest the enemy's lines. He was the first to cross the river at Chickahominy, and while brigadier-general of cavalry routed Hampton's cavalry at Gettysburg, where he had two horses shot under him. In 1864 his brigade led the column in Sheridan's raid toward Richmond. He was brevetted major-general of volunteers for gallantry at the battle of Cedar Creek, and was in command of a division at the surrender of Appomattox. His rash but memorable campaign against the Sioux was undertaken early in 1876. With 1,100 men, including guides and scouts, he followed an Indian trail to Little Big-Horn River. Here he found a large encampment. Dividing his command, he tried to ford the stream three miles farther down. This brought on a battle in which Custer and his detachment of 277 troopers were surrounded by 3,000 warriors and slain to a man, June 25, 1876.



GENERAL CUSTER

**Cu'ticle** (in plants). In many plants, especially in leaves, the outer part of the walls of the epidermis becomes transformed into an impervious structure called cuticle. As new wall-material is continuously laid down, the cuticle gradually thickens and may become a very thick layer outside of the epidermis. It is a structure which protects well against drought, cold, etc., and is especially noticeable in plants of dry regions. The same substance is also developed on the surfaces of spores as a protection.

**Cut'ler, Manasseh,** an American botanist and Congregational minister, was born at Killingly, Conn., May 3, 1742. After graduating at Yale in 1765, he took degrees in the three professions of theology, law and medicine. He then became regimental and brigade chaplain in the Revolutionary War. He was an enthusiastic botanist, and his description of the native flowers of New England was the first botanical description made in the country. In wide scientific and other learning Dr. Cutler was the foremost man in America after Franklin. He is best known for his con-

nection with the famous Ordinance of 1787. A member of the Ohio Company, formed by the Massachusetts army-officers to settle on Ohio lands, the purchase of the lands from Congress was intrusted to him. Some 5,500,000 acres were bought for the Ohio Company and others, and it was Dr. Cutler's making a condition of the purchase that the new settlers should take with them their own laws, that brought about the passage of the ordinance in its present form, including the anti-slavery clause. Dr. Cutler also was a member of Congress from 1801 to 1805. He died at Hamilton, Mass., July 28, 1823.

**Cuttlefish,** one of the mollusks, with a head surrounded by eight or ten arms, provided with cup-like suckers. Two of these arms are longer than the others, are enlarged on the ends and are called antennæ. They are related to the chambered nautilus, squid, etc. They have no shell externally, but underneath the skin of the back is found a limy structure called cuttlefish bone. It is often seen in bird-cages. The eyes are large and prominent, and there is a pair of horny jaws in the midst of the cluster of arms. The body is elliptical in outline, and has fins running along each side. It is surrounded by a mantle that also incloses a cavity for the gills, which are two in number. There is a funnel-like tube opening into the mantle-cavity, and the animal can, by contracting muscles, cause the mantle-cavity to close and then throw water out through the funnel or siphon in jets. It can swim forward by the use of the fins, and backward by throwing jets of water through the siphon. These animals also possess a bag of inky fluid, some of which can be thrown into the water when they become alarmed, and thus conceal their position while they swim away. Sepia and India ink were manufactured from this ink of the cuttlefish. They are carnivorous and seize their prey by means of their arms. The common squid of the Atlantic coast is closely related. It is commonly used for bait by the fishermen. The octopus or devilfish also is a near relative. See OCTOPUS.

**Cutworm,** caterpillar of various species of owlet moths, a worm very destructive to vegetation. Both moth and worm are nocturnal. In the latter part of summer the female moth lays her eggs on plants near the ground. The larvæ feed on tender roots of grasses and various plants, and by spring are ready to attack early vegetation. During the day they hide under the surface, and coming forth at night cut off plants close to or just under the surface. They are enemies of garden vegetables, wheat, Indian corn, oats and cereals generally. Lacking other vegetation, almost all the numerous species adopt the climbing habit, ascend grape-vines, rose and berry-bushes and trees, devouring leaf-buds and eating of the early fruit. Hodge recommends, as protection against cutworms, folding a piece of stiff paper around a plant-stem in such a manner that the paper reaches an inch into the ground and two or three inches above the surface. To save their corn-fields, the Indians used to pick the cutworms off by hand, a method still in use. Toads and robins are effective helpers in keeping down the grievous pest.

**Cuvier** (*kū'vyā'*), **Georges, Baron,** was born Aug. 23, 1769, at Montbéliard, France. At 18 he became tutor in a family at Caen, Normandy, and while all France was in the throes of the reign of terror he peaceably spent his leisure eagerly studying the fossils and fishes of the neighboring coast. He became professor of comparative anatomy at the Jardin des Plants, in Paris. Cuvier was the first to compare the structure of fossils with that of animals, which we now find. He also founded the science of comparative anatomy. In this field his work and success were great, and he was recognized in France as the greatest of living naturalists. He also held office under Napoleon and Louis XVIII, and became a peer of France. He died at Paris, May 13, 1832.

**Cuyp** (*koip*), **Albert,** Dutch painter, was born at Dordrecht, Holland, in 1605. His pictures represent grazing cattle, moonlight, winter-landscapes, horse-markets, hunts, camps and cavalry-fights; in his paintings the effect of golden sunlight has never been surpassed. While he lived, and long after, his paintings were little thought of, but now they rank high. He died in 1691. His father, known as Old Cuyp, and his nephew, Benjamin, also were well-known painters.

**Cyanide-Process, The.** The cyanide-process is one of two ways in which gold is extracted from low-grade ores, which contain only from 2 to 10 dollars per ton of gold. The ore is first crushed in stamp-mills, until it is quite fine; it is then treated with a solution of potassic cyanide, which dissolves the gold. This liquid is then treated with zinc, by which the gold is released and precipitated. This method is chiefly employed in the Transvaal gold-mines and, to a less extent, in the low-grade mines of Dakota, Wyoming and other western states.

GLOEOCAPSA, ONE OF THE CYANOPHYCEÆ

**Cyanophyceæ** (*sī'a-nō-fis'ē-ē*). One of the four plant-groups which make up the algæ, commonly called the blue-green algæ, and often the green slimes. They are

the simplest of algæ, the body consisting of single cells or chains and filaments of cells, and are found in fresh water and damp places everywhere. All the forms show a tendency to become imbedded in a jelly-like substance which is merely the material of their walls transformed into mucilage. In addition to the chlorophyll they contain a blue pigment, which gives the bluish hue to their bodies. Many of them exhibit the power of motion, the free filaments of oscillaria moving almost continually, while the chains of nostoc at times wriggle out of the mass of mucilage in which they are imbedded. They have no sexual reproduction, multiplying almost exclusively by ordinary cell-division. In many of their characters, they closely resemble the bacteria, and by many botanists they are associated with them in a common group.

NOSTOC, ONE OF THE CYANOPHYCEÆ

**Cy'cads.** A group of plants which next to the conifers is the most prominent group of living gymnosperms. They are confined to the tropics and subtropics, and contain about 80 species, nearly equally distributed between the oriental and occidental tropics. The principal genus in the orient is *Cycas*, and in the occident *Zamia*, the latter genus being represented in southern Florida. The stem does not branch, and in many cases rises in a straight column, as in the palm, bearing at its summit a rosette of very large fern-like leaves. In other cases the stem is like a great tuber ensheathed by the thick bases of fallen leaves, and crowned with the rosette of huge fern-like leaves. The seeds are born in cones or strobiles, often of great size, but instead of ripening dry with a hard coat, as in the conifers, they become fleshy on the outside, with a hard stone within, and are much like plums. The group is very fern-like, and probably has come from the ferns. One of the most recent and important discoveries in connection with the group is that their sperms are ciliated and can swim, as in the ferns. See GYMNOSPERMS.

**Cy'clone,** a phenomenon of the earth's atmosphere, which is practically always exhibited in any region of low barometer, that is, in any region where the pressure of the air has fallen considerably below its average. To understand the nature of a cyclone the student must bear in mind the fact that wind consists simply in the transport of air from regions of high pressure to regions of low pressure. In the northern hemisphere the air does not rush directly in toward the center of a region of low pressure, but sweeps around toward the center in more or less of a spiral, so that an observer, looking down upon a center of low pressure, would find the wind traveling in a direction opposite that of the hands of a watch. This vorticose motion of the wind is called a cyclone. These cyclones are generally many hundreds of miles in diameter. Now and then they become very small in diameter, and in these circumstances they are apt to be exceedingly destructive, and are called tornadoes. In America these cyclones travel with a speed ranging from 20 to 40 miles per hour. If now we consider a region of high pressure, it is evident that the wind must in general blow away from the center of this region. These winds also assume somewhat of a spiral form, as they do in the case of low-pressure areas: only here the direction of rotation is clockwise. This phenomenon is known as an *anticyclone.* In general the anticyclone is not marked with the same regularity of structure as the cyclone. In the southern hemisphere the direction of rotation of these two kinds of vortices is exactly the opposite of that found in the northern hemisphere.

**Cym'bals** are a pair of thin, round, metal plates, with a hollow part in the center, in which a leather strap is fastened for holding the hand. When struck one against the other, a loud, harsh sound is made. They were used in ancient times, by the Greeks, in the worship of the goddess Cybele. The best cymbals are made in Turkey and China. Attempts to discover the composition of the metal have failed. The cymbals generally play the same part as the bass-drum, and in orchestras they are played by the same performer, one cymbal being fixed on the drum, the other held in one hand, while the other hand wields the drumstick. Cymbals are mostly used in military music.

**Cyme** (*sīm*). A flat-topped cluster of flowers in which the inner flowers bloom first. See INFLORESCENCE.

**Cy'press.** Species of several genera of conifers. *Chamæcyparis* contains five species native to North America and Japan. They are all handsome trees, with the opposite scale-like leaves densely clothing the branches. The best-known species are the white cedar of the eastern United States, a tree 70 to 80 feet high; the yellow cedar of the northwest coast, a tree which reaches 120 feet in height; and Lawson's spruce of the Pacific coast, a magnificent tree which sometimes becomes over 200 feet high. *Cupressus* is a genus containing about ten species, found both in North America and the orient. They resemble the species of *Chamæcyparis* and are very ornamental evergreen trees, but are hardy only in California and the gulf-states. *Taxodium* contains three species, one in China, one

in Mexico, the third (*T. distichum*), the bald cypress, in southeastern United States. This last species grows in swamps and along rivers, is a large tree, often reaching 150 feet in height, and gives the name to the so-called cypress-swamps.

**Cy'prus,** an island of the Mediterranean, south of Asia Minor and west of Syria. It is about 140 miles long and 60 miles wide, and covers 3,584 square miles. There are two main ranges of mountains; the highest peak is Mt. Troödes, 6,352 feet above the sea. There are no harbors, rivers or lakes worthy of the name. It is governed by Great Britain by treaty (1878) with Turkey. The capital and seat of government is Nicosia (population, 16,052); the two chief ports are Larnaca and Limasol.

Cyprus was colonized very early by the Phœnicians and afterward by the Greeks. It came under the sway successively of the Egyptians, Persians, Macedonians and Romans. The Cypriotes were one of the first Gentile people to become Christians, and were visited by St. Paul. The island was afterward taken by the Saracens; by Richard I on his way to Syria during the third crusade; by Venice; and lastly by the Turks in 1570. In 1878 Cyprus was occupied by the British, with the understanding that it is to keep it until Batum, Kars and Erzerum are restored by Russia to Turkey.

Cyprus produces wheat, barley, cotton, silk, flax, tobacco, wool, oranges, olives, grapes, etc. and great quantities of wine. Cyprus was once noted for its copper-mines, and copper got its name from that of the island, but it is only mined now at one place. The forests have mostly disappeared. The great scourges of the country are locusts and goats. The Cypriotes are peaceable, orderly and easily ruled. They are healthy and well-grown; the men, as a rule, are handsome, but the women are rarely so. Modern Greek and Turkish are spoken on the island. Population, 274,108.

**Cy'rus the Great,** founder of the Persian empire, is first known to us from the record on the cuneiform, clay tablet-and-cylinder, which recounts his reign, his conquest and capture of Astyages, king of Media, in 549 B. C. At this time Cyrus was called king of Elam. Year after year was idly spent by Nabonidas, king of Babylonia, at Terma, a suburb of the capital, Babylon, while his son—doubtless Belshazzar—was with his army in Akkad (northern Babylonia). In 538 Cyrus, favored by a revolt of the tribes on the Persian Gulf, advanced on Babylon from the southeast, and, after giving battle to the army of Akkad, took Sippona and lastly Babylon "without fighting." Cyrus at once originated a friendly policy in religion. The nations who had been carried captive to Babylon, along with the Jews, were restored to their countries and allowed to take their gods with them. The empire of Crœsus in Lydia had been taken two years before; and Cyrus was now master of all Asia from the Mediterranean to the Hindu-Kush. The conqueror's hold over Asia Minor and Syria was much strengthened by his friendly relations with the Phœnicians and the Jews, who received the news of his triumphs with joy. After the great king had widened his dominions from the Arabian Desert and the Persian Gulf to the Black Sea, Caucusus and Caspian, he died in 529 B.C. Cyrus ranks high among Asiatic conquerors. He was a wise ruler, whose aim was to soften by kindness the harsh rule which his sword was constantly extending.

**Cy'rus the Younger,** the second son of the Persian king, Darius Nothus, was born in 424 B. C. He headed a conspiracy against his brother Artaxerxes Mnemon, who had succeeded to the throne in 404 B. C. The plot was discovered, and he was sentenced to death, but afterward pardoned and even restored to his office as satrap of Asia Minor. Here he planned a war against his brother, but hid his purpose till the last. In the spring of 401 B. C. he left Sardis at the head of 100,000 Asiatic and 13,000 Greek hired troops, under pretense of punishing the robbers of Pisidia. Artaxerxes, warned of his treachery, was ready to meet him. The battle was fought on the plains of Cunaxa. Cyrus was defeated and slain, although the Greeks fought with the greatest courage and even drove back that part of the enemy in front of them. Xenophon's *Anabasis* gives an account of the expedition. It showed that the Persian empire was a shell, and inspired Agesilaus and Alexander to assail it.

**Cy'toplasm** (in plants), the name applied to the general protoplasm of a cell as distinct from the nucleus. See CELL.

**Czar** (*zär*) or **Tsar,** a title of the ruler, the autocrat of all the Russias. The word comes from an old Slav word *cesar*, which the Poles spelled as *czar*, meaning king or emperor. The Russians use the Latin word *imperator* to express the idea of emperor. The first independent Russian monarch to use the title was Ivan IV, "the Terrible," who was crowned at Moscow in 1547. The Empress of Russia is styled the Czarina. The following have been the czars and emperors of Russia, from the era of the election of Michael Romanoff. Czar Peter I was the first ruler who adopted, in 1721, the title of emperor.

HOUSE OF ROMANOFF—MALE LINE.

| | | | |
|---|---|---|---|
| Michael | 1613 | Ivan and Peter I | 1682 |
| Alexis | 1645 | Peter I | 1689 |
| Feodor | 1676 | Catherine I | 1725 |
| Peter II | 1727 | | |

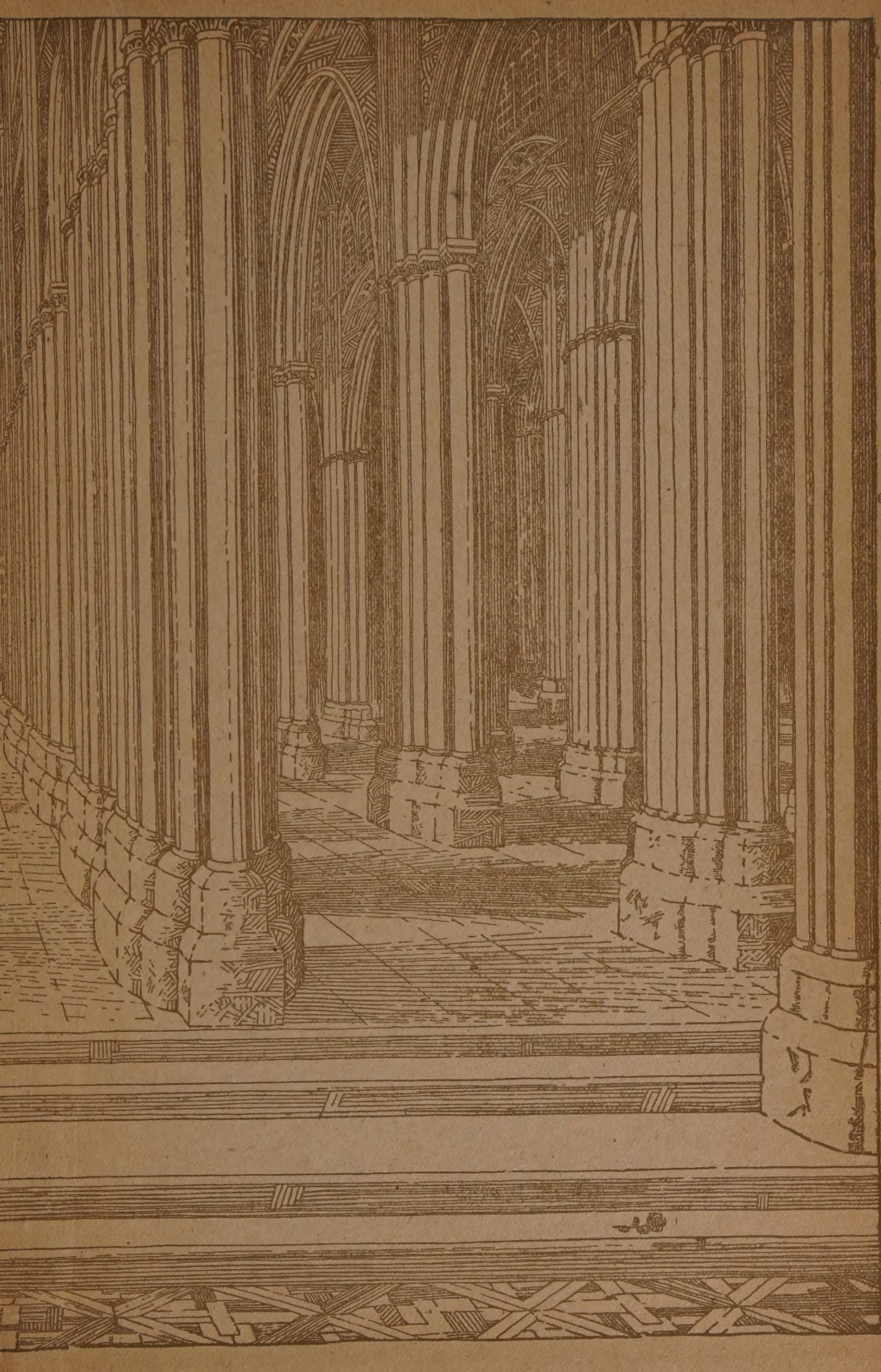
HOUSE OF ROMANOFF—FEMALE LINE.

| | | | |
|---|---|---|---|
| Anne | 1730 | Elizabeth | 1741 |
| Ivan VI | 1740 | | |

HOUSE OF ROMANOFF-HOLSTEIN.

| | | | |
|---|---|---|---|
| Peter III. | 1762 | Nicholas I. | 1825 |
| Catherine II. | 1762 | Alexander II. | 1855 |
| Paul | 1796 | Alexander III. | 1881 |
| Alexander I. | 1801 | Nicholas II. | 1894 |

**Czechs,** (*chĕks*) are the most westerly branch of the great Slavic family of nations. In the latter half of the 5th century A. D. the Czechs migrated from their lands in Carpathia, on the upper Vistula, to the country now known as Bohemia. Here, in Moravia and in other parts of Austria the Czechs now number in all some 7,000,000.

**Czernowitz** (*chĕr'nô-vits*), a provincial capital of Austria, stands 720 feet above the sea, near the Pruth River. Among its buildings are the palace of a Greek archbishop, his cathedral, the Armenian church, the synagogue and the Austria Monument. The university, founded in 1875, has 41 professors and lecturers and about 400 students. Population, 87,128, of whom 20,000 are Jews.

**Czerny** (*chĕr'nĕ*), **George,** meaning Black George, leader of the Servians in their struggles for independence, was born of poor parents, Dec. 21, 1766, near Kragujevatch, Servia. He was concerned in a rebellion against the Turks in 1787, and afterward became a cattle-dealer. In 1801 a detachment of janizaries broke into his house and plundered it. Black George fled, vowing vengeance. He managed soon to gather a band of discontented fellow-countrymen, and began a sort of guerrilla warfare against the Turks. In course of time his little band increased in numbers, and in 1804 he was able to capture the fortress of Schabaz. Later on he besieged Belgrade, and early in 1806 routed the Turks at the Rivers Drina and Morava. Secretly aided by Russia, he captured Belgrade in December of that year (1806). The treaty of Slobosje was extorted from the Ottomans two years later, after which Black George was elected governor by the people and recognized as prince of Servia by the sultan. The Russians sustained the prince in his position till Napoleon's invasion of Russia in 1812, when he was perforce left to shift for himself. The Turks at once recommenced hostilities. They were successful, and Czerny was compelled to flee to Austria, where he lived for some time. Meanwhile the freedom of Servia had been again secured through the leadership of Milosch Obrenowitch. When Czerny returned, in July, 1817, he was murdered at the instigation of the new leader, Prince Milosch.